AUGUST, 1954

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

1934 · 1954 20th ANNIVERSARY YEAR

Do You Want PRODUCTION OR PROFIT?

•

AIR CYLINDERS and their Selection for Tooling Applications

•

SPECIAL TOOLING — Captive or Contract?

•

Three High Production Jobs Tooled For ARBIDES ON AUTOMATICS

•

ortable PNEUMATIC TOOLS Reduce Production Costs

•

Industrial Dust Control System

Huebner Publications, Inc.
CLEVELAND 18, OHIO

BPA

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#5C Lathe Collet

#22 Brown & Sharpe Collet

1" R&RA Acme Gridley Collet

Davenport Collet

#22 Brown & Sharpe Feed Finger

14" AC Warner & Swasey Collet

1½" Cone Collet

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in stock for your automatics, lathes and milling machines

1⅛" #61 New Britain Master Collet

BALAS also makes

- Master Collets and Pads
- Pushers and Feed Fingers
- Master Pushers and Pads
- Ejector Collets
- Collet Sleeves and Chuck Nuts for B&S Machines
- Carbide Faced Stock Stops for B&S Machines

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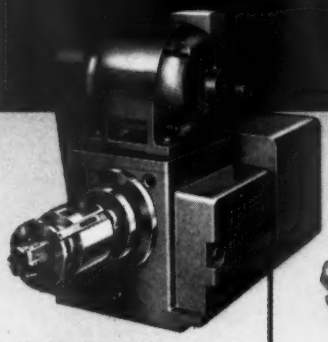
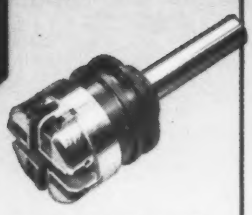
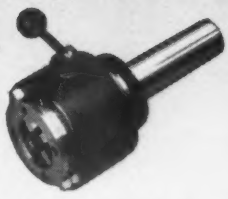
Reduce Increase



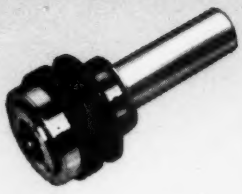
Precision-Pak with die heads and collapsible taps automatically taps holes up to 4" dia., cuts external threads up to 3½" dia.—also bores and reams. Lead accuracy assured by precision lead screw.



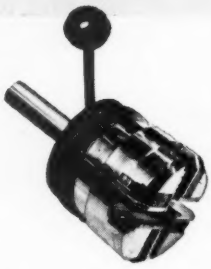
Rotating Die Heads, Type "ORB" with snap action trip and quick change radial type chasers, cut straight threads ⅛" to 5" dia.



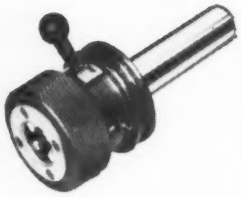
Non-rotating Die Heads, Type "OLB" with pull off snap trip and quick change radial type chasers, cut straight threads ⅛" to 5" dia.



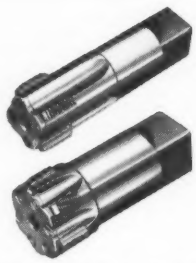
Rotating Die Heads, Type "TRB" with snap action trip and quick change Tangent chasers, cut straight threads ½" to 2" dia.



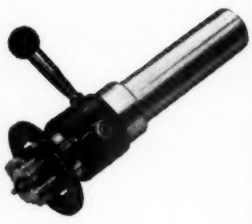
Non-rotating Tangent Die Heads, Type "TLC", with pull-off snap trip and quick change chasers, cut straight threads ¾" to 2" dia.



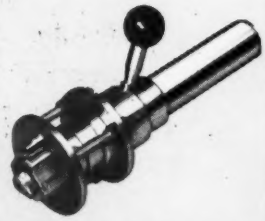
New 4 in 1 Type "ACB" Die Heads, Rotating and Non-Rotating feather action trip, cut straight threads ⅛" to 4" and tapered pipe threads ⅛" to 3½".



Solid Adjustable Taps "EHB" and "RHB" with removable chasers, cut threads 1¼" to 5" dia.—ideal for salvage work.

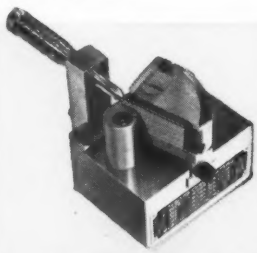


Standard Collapsible Machine Taps, Rotating or Non-Rotating, with easy size adjustment, cut straight threads 1¼" to 7" dia.

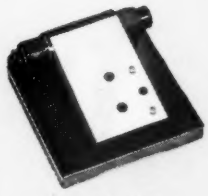


Semi-receding Pipe Taps, Rotating or Non-Rotating, with taper receding action, cut 1" to 6" taper pipe threads. May be arranged for straight threads also.

Type "L" Machine Taps, Rotating or Non-Rotating, with 18 interchangeable nose pieces and 2 bodies, cut a range of straight threads to 6¾" dia.



Tangent Chaser Micrometer Setting Fixture provides longer chaser life and better threads through more accuracy in setting chasers in their holding blocks.



Universal Chaser Grinding Fixture for use on either a surface or cutter grinder assures accuracy in grinding chasers of all types.

For more complete information on Sheffield-Murchey threading tools, get in touch with your local representative or write for Catalog MU-153.

Murchey Division, The Sheffield Corporation
Dayton 1, Ohio, U. S. A.

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

6548

There's a Standard **PUTNAM END MILL** *for Your Job!*

Universal Application of Putnam End Mills (there are over 1200 standard sizes and types) permits users to select a standard end mill specifically designed for each job.

Many standard Putnam End Mills are of a type considered "specials" by other manufacturers. Also, a wide range of sizes are available in every standard type of end mill to provide complete application coverage.

From smallest to largest sizes—from fine intricate machining to rugged milling operations there is probably a standard Putnam End Mill that will mill your job more efficiently. However, Putnam will also produce "special" end mills to your specs for those extra-special applications.

PUTNAM TOOL COMPANY

2985 CHARLEVOIX AVENUE • DETROIT 7, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 3

for Quality Reamers

L&I

stands alone

L&I

The Reamer Specialists

LAVALLEE & IDE, INC.

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CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING and PRODUCTION

formerly
Tool-Die-Machine PROGRESS 1934-1941
TOOL & DIE JOURNAL 1941-51

VOL. XX—No. 5 AUGUST, 1954

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They have the influence that enables them to adopt the ideas and the processes which TOOLING and PRODUCTION describes in every issue AND the authority to recommend, to specify and/or to buy everything that may be needed to reduce costs, increase production or improve quality. These men for whom, each month, our editors seek out or write TOOLING and PRODUCTION'S meticulously accurate stories of "Know-How" and "Tell-How" are T & P's exclusive Cycle of Buying Influence (CBI) in their plants.

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PUBLISHERS OF: Tooling and Production ★ Die Designing and Estimating ★ Plastics Molds
The Know-How-Library of Tooling and Production

*** DE VLIEG OF DETROIT**

. . . is proud to reproduce this unsolicited advertisement by American Type Founders as it appeared in nationally circulated technical magazines.

This ad is reproduced through the courtesy of AMERICAN TYPE FOUNDERS

This machine hunts for—and finds—dead center!

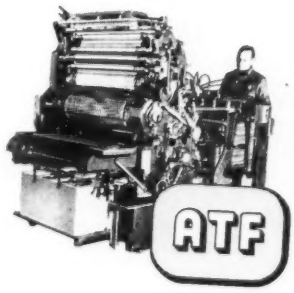
This De Vlieg Jigmil is used to locate and bore the cylinder, gear-driven ink rollers, and gear bearing holes in ATF Chief frames.

Once the adjustments have been set, the Jigmil automatically positions every subsequent frame by moving its machine table or spindle head until the desired center is located to within 3.5 10,000ths of an inch. Then this 12-ton precision borer is micrometer-set so accurately that it will remove a pencil mark from a boring without cutting the metal.

Bearing holes not so accurately located on the press frame could easily throw cylinders out of parallel, cause excessive wear to precision gears, make smooth high-speed operation impossible and take years off the productive life of a press.

That's what we mean when we talk about the precision engineering that goes into an ATF Chief. You won't find more accurate borings in any press regardless of price. It's like getting Cadillac construction for Chevrolet prices.

It will pay you well, next time you're in the market for a small offset press, to ask for the full story on the precision-engineered ATF Chief. Write AMERICAN TYPE FOUNDERS, *a subsidiary of Daystrom, Inc.*, 200 Elmora Avenue, Elizabeth, New Jersey.



Better, More Profitable Printing from the Widest Line of Processes

GRAVURE . . . LETTERPRESS . . . OFFSET

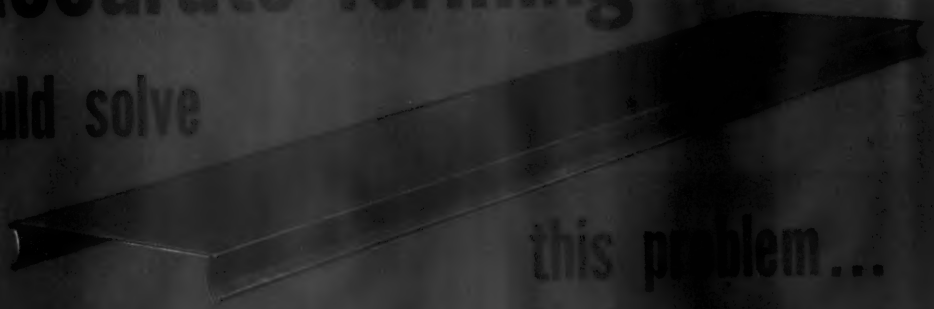
Come to Detroit . . . SEE A PRACTICAL DEMONSTRATION OF "JIGLESS BORING"

DE VLIEG MACHINE COMPANY • 450 Fair Ave., Ferndale • Detroit 20, Michigan

A request on your company letterhead will bring a copy of our comprehensive illustrated catalog.

CIRCLE INFORM-A-GRAM KEY NO. 5

Only accurate forming could solve this problem...



Note the clean straight lines of the moldings formed on the Cincinnati Press Brake.

Photo courtesy of E. O. Schoen Mfg. Co., Inc., Grand Rapids 2, Mich.

The long steel shelves of these sectional display racks are formed so accurately that sections match perfectly with lines straight and clean.

The Cincinnati Press Brake is forming to such close tolerances that a masking strip previously used is eliminated. A production increase and no discards has materially reduced costs while product was improved.

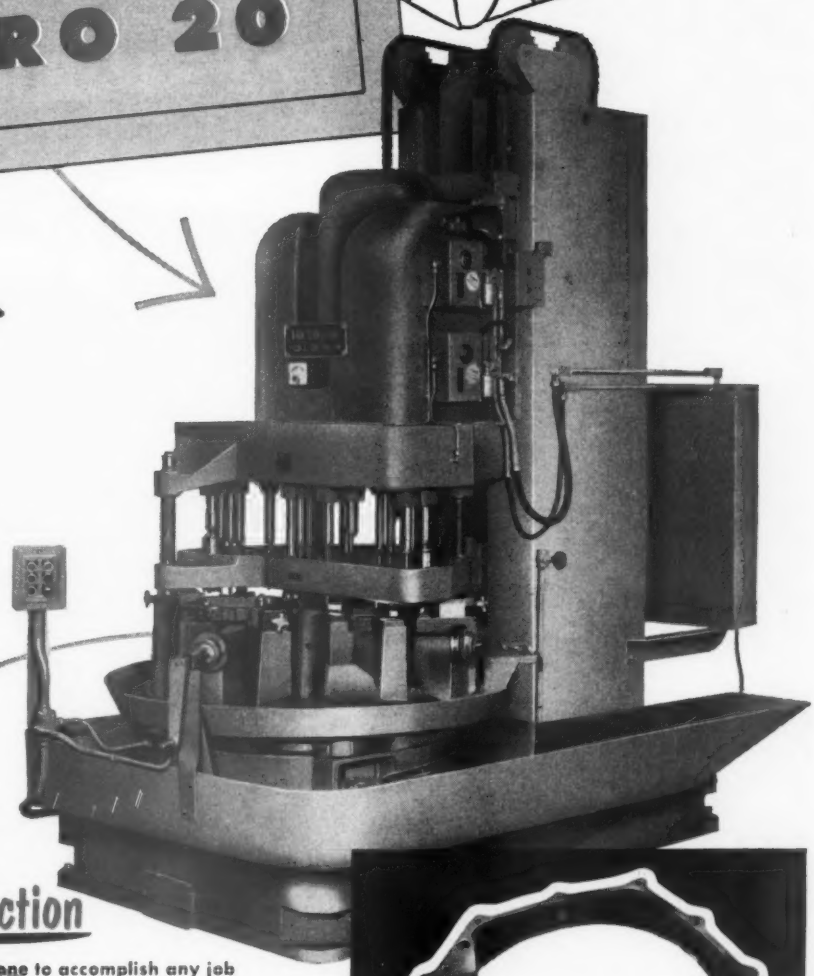
Write for the New 72-Page Cincinnati Press Brake Catalog.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

MICHIGAN HYDRO 20

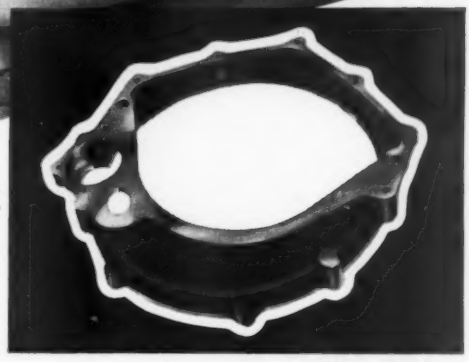


Tooled Up To...

DRILL, REAM
CHAMFER
ROUGH BORE
FINISH BORE
100 FLY WHEEL HOUSINGS PER HOUR

For Faster, More Economical Production

- Rugged column forms firm backbone to accomplish any job
- High strength to power ratio
- Automatically lubricated throughout
- Drill head mist lubricated
- Indicator (mounted at the front) protects motor from overloads
- Fixture mounted on Michigan 4-station 42" hydraulic index table



We also invite your inquiries as to our line of tapping units, and index tables, both manual and automatic

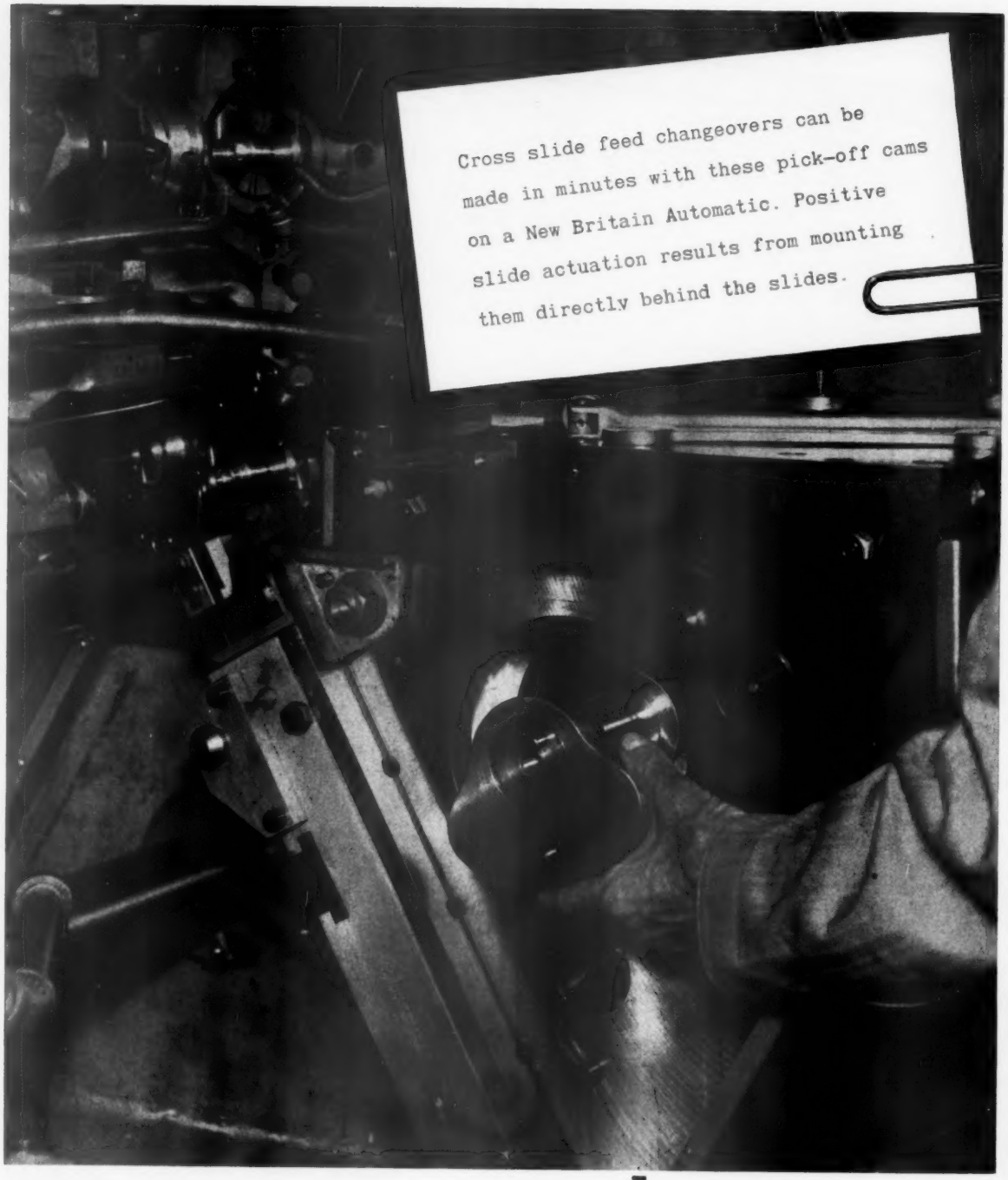
Four other sizes available

Hydro—3	Hydro—10
Hydro—5	Hydro—30

Michigan DRILL HEAD CO. Detroit 34, Michigan

engineers and manufacturers of production machines and drilling equipment

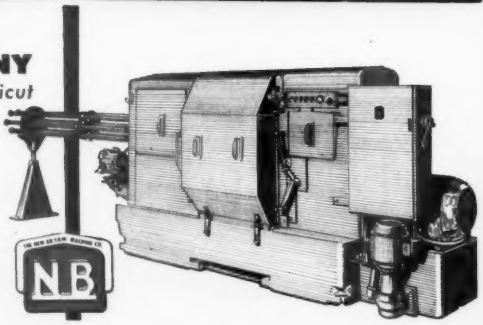
CIRCLE INFORM-A-GRAM KEY NO. 7


Cross slide feed changeovers can be
made in minutes with these pick-off cams
on a New Britain Automatic. Positive
slide actuation results from mounting
them directly behind the slides.

THE NEW BRITAIN MACHINE COMPANY
New Britain-Gridley Machine Division, New Britain, Connecticut

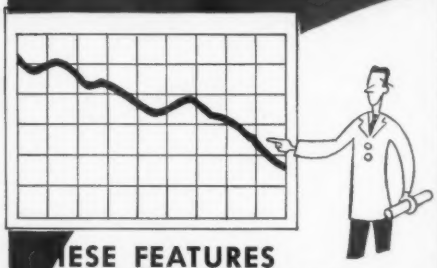
NEW BRITAIN *Automatics*

Machines for Making Progress
Automatic Bar and Chucking Machines
Precision Boring Machines
Lucas Horizontal Boring, Drilling and Milling Machines
New Britain +GF+ Copying Lathes



CIRCLE INFORM-A-GRAM KEY NO. 8

Blade Spade Drills — " diameter in stock sizes. lasts indefinitely, only blades be replaced.



ESE FEATURES
f Standard WAUKESHA
Inserted-Blade Cutting Tools
Save You Money —

Replaceable Blades — Cost only a fraction of the price of a solid tool, assure long term economy.

Interchangeability — Each size of Waukesha Spade Drill Holder takes a ½" range of sizes in spade blades, except in the smaller sizes which cover only a ¼" size range.

Shear-Cutting Action — Waukesha Blades have a "knife-slice" cutting action that curls chips away from stock, prevents scoring, assures free cutting, requires less power.

More Grinds per Blade — More Holes per Grind
Waukesha Blades can be advanced and re-ground before discarding — yielding a substantial saving over High Speed Solid Steel Tools — and the high quality of Waukesha Blade Stock assures More Holes per Grind.

Cut Tooling Costs

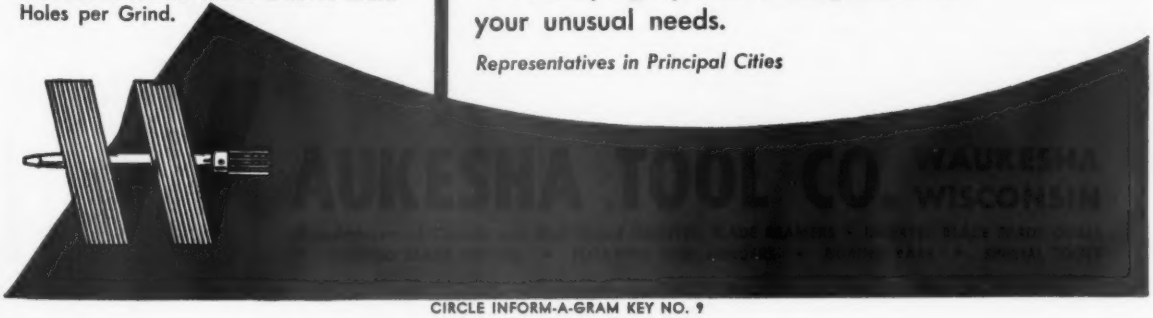
with WAUKESHA Standard Cutting Tools...

Adjustable Blade Reamers — Inserted Blade Spade Drills — and other Standard Cutting Tools by Waukesha — are saving thousands of dollars in tooling costs, in all types of reaming, drilling and boring operations. Their versatility and adaptability eliminate substantial investments in special tools — and their inherent features result in operating and maintenance economies which you cannot afford to overlook.

consult WAUKESHA

— for Competent Cutting Tool Counsel. Waukesha sales representatives and engineers are qualified to work with your staff in adapting Standard Waukesha Tools to your needs — or, if necessary, in developing Special Cutting Tools for your unusual needs.

Representatives in Principal Cities



CIRCLE INFORM-A-GRAM KEY NO. 9

For Years, Milne Has Been Delivering Hollow Die Answers* To Tooling Problems..

*All are Genuine Tool Steels

GRAPHITIC
HOLLOW DIE STEEL
Widest Range Of Applications Including forming, drawing, sizing, flanging, embossing, and combination dies, work support blades, forming rolls, steel mill straightening rolls, machine parts, plug, thread and ring gauges, cams, bushings, sleeves, mandrels, fixtures and other applications.

NOW MILNE has the answer to a diemaker's dream!

- MINIMIZES MACHINING
- CUTS WASTE
- PRODUCES SUPER WEAR-RESISTANT, NON GALLING TOOLS

JIC-06 . . . Oil Hardening, Non-Deforming . . . Full Length Kolorkoted Pink and Gray for Permanent Identification

This new combination of Timken Graphitic Steel features in Hollow Die (Tubular Tool) form is Milne's latest bee-line to better, lower-cost tooling.

Has a double advantage over standard oil hardening tool steels.

1. Free graphite makes it the fastest, easiest machining tool steel in tubular form and insures non-seizing properties.
2. Diamond-hard carbide particles guarantee super wear resistance.

Rough turned O.D. and I.D. Saw cut faces. Furnace annealed – no scale. Cut to any length.

Stocks of a range of sizes being built to meet demand. Write for a stock list and Milne's new Hollow Die Catalog section.

Available Across The Nation . . . Wherever Milne Operates

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CHICAGO
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SANDERSON-NEWBOLD, LTD.
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Complete line of tool steels . . . Wide range of grades and sizes.

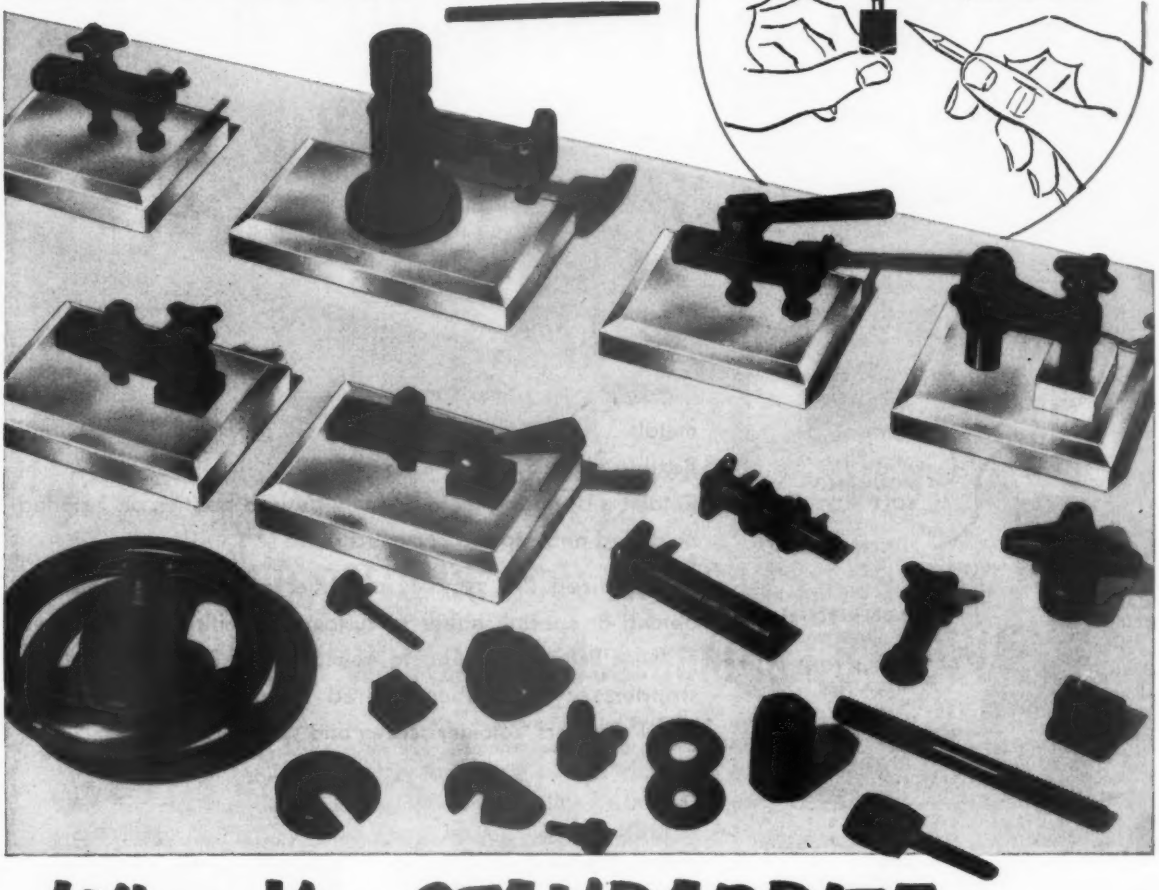
A. MILNE & CO.
Established 1887
745 WASHINGTON ST., NEW YORK 14, N.Y.
America's Leading Tool Steel Specialists
Complete Line Of Tool Steels—Hollow and Solid

CIRCLE INFORM-A-GRAM KEY NO. 10

In Jig and Fixture Components . . .

You Get The BEST

Greater uniformity, higher strength, longer life are provided by quarter-turn screws from *forgings*. All Lodding fixtures Parkerized to prevent rust.



When You STANDARDIZE

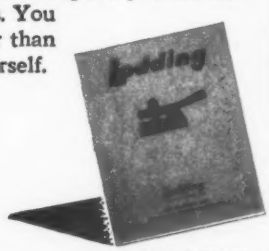
With

YOU GET WHAT YOU WANT

Here in the Lodding Line you will find standard assemblies and details to meet your every need — all the components necessary to standardize engineering practice, save design and labor costs.

AND YOU GET IT QUICKLY

Immediate shipment from completely stocked, coast-to-coast distributors. You receive parts much faster than you can make them yourself.



Lodding INC.

81 BEACON ST., WORCESTER 1, MASS.

THE LINE OF JIG AND FIXTURE COMPONENTS

Write for Catalog — *includes full-scale layouts of every Lodding fixture. Template sheets available. No obligation.*

CIRCLE INFORM-A-GRAM KEY NO. 11

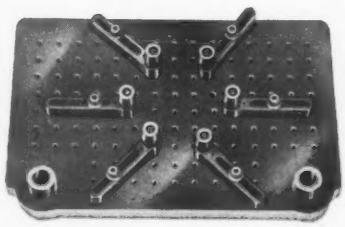
New PUNCH & DIE BUTTON POSITIONING Flexibility with R-B Flex-Mount RETAINERS

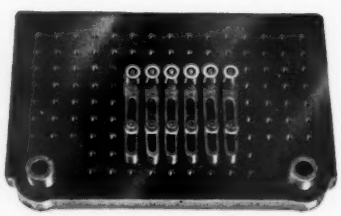
Cut your set-up time for short production runs on light gauge metals . . . R-B Flex-Mount Retainers permit quick, easy and flexible mounting of punches and die buttons. For, Flex-Mount Retainers are easily bolted in any desired position on T slotted or drilled and tapped commercial die sets.

Standardized R-B punches and die buttons (round, square, oblong or special shapes to customer specifications) are used in these retainers. Stripping is accomplished with R-B rubber strippers or R-B rubber covered springs to eliminate costly metal strippers, retainer screws and springs.

TYPICAL Flex-Mount POSITIONING Flexibility

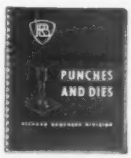
Shown are but two of an almost unlimited number of mounting arrangements that can be made with Flex-Mount Retainers.





Use R-B Engineering Service for Your Tough Piercing Problems

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 78 • 12635 BURT RD. • DETROIT 23, MICHIGAN



Please send me additional information.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

Also Produced in
OTHER ALLIED PLANTS
SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
PRECISION GROUND PARTS
SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

CIRCLE INFORM-A-GRAM KEY NO. 12

"Dependable performance...matchless service —that's why our pressroom is 96% BLISS"

says Ben Suckle, President of Suckle Electronics Co., one of the largest custom sheet metal fabricators for the electronics industry.

The tail wags the dog in this modern-day Horatio Alger story:

Back in 1946, Suckle Electronics Company, a consulting firm specializing in radio and television engineering, decided to broaden the base of its business by entering the contract stamping business in a limited way.

The sky, though, turned out to be the limit. For today, a scant seven years later, Suckle Electronics Company is one of the largest custom sheet metal fabricators supplying the electronics industry.

"In our first year," says Ben Suckle, "a lack of capital forced us to build up our pressroom with second-hand equipment. We realized, however, that to meet the quick delivery demands of the electronics industry a dependable pressroom is a must. In 1948, we ordered our first new press—a Bliss. We quickly added more, and now there are 40. We standardized on Bliss because our experience proved that the Bliss presses can take our 96-hour-a-week operation, since Bliss replacement parts are truly interchangeable without machining or hand-fitting, and because engineering and other services offered by Bliss are eminently satisfactory."

If, like Suckle Electronics, you're looking for dependability in your pressroom, call a Bliss engineer. He will be glad to help you pick the proper press for your operation.

BLISS
SINCE 1857

on your press is more than a name...it's a *guarantee*

E. W. BLISS COMPANY, Canton, Ohio

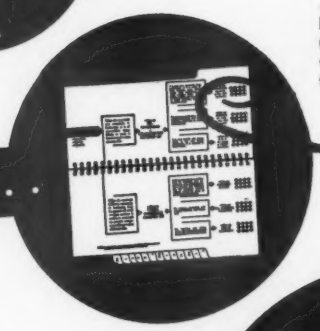
PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Subsidiary: The Die Supply Company, Cleveland, O. • E. W. Bliss (England) Ltd., Derby • E. W. Bliss Company (Paris) France

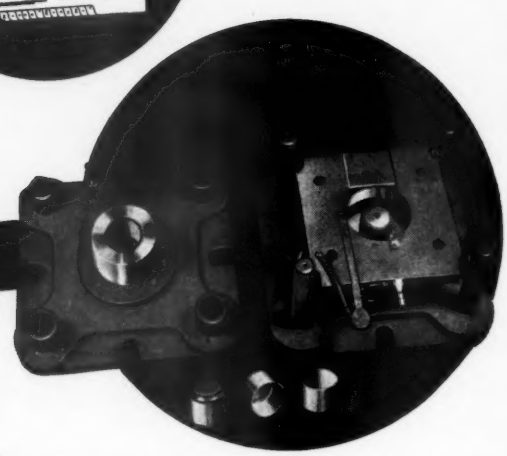
U. S. Plants in Canton, Salem and Toledo, Ohio; Hastings, Michigan; and San Jose, Calif. *Branch Offices* in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. *West Coast Representatives:* Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. Other representatives throughout the world.

How ONE TOOLMAKER . . .

USED THIS GUIDE . . . . . —then use HAMPDEN (Oil-Wear) or No. 610 (Air-Wear)



TO HOLD DOWN UNIT COSTS . . .



AT which step in your tooling process would you welcome real help in reducing tool and die costs? Tool Steel Selection? Heat Treating?—or on-the-job "Trouble-Shooting"? Here's how you, like the maker of the Dies shown here, can start to reduce costs with a Method that helps you at *all 3* steps.

First, to simplify selection, use the handy Selector Section in the Carpenter Matched Tool Steel Manual. Quickly and surely, it enables you to put your finger on the proper steel for best results. Next, to further insure tool and die performance, use the Manual's complete heat treating instructions—they have been simplified beyond anything previously known. It's easy to get started—use the Carpenter Matched Set Method to help you "trouble-shoot" your present tool and die jobs.

For better, lower-cost tooling, put this practical, easy-to-use Method to work, now. Ask for the 189-page Carpenter Matched Tool Steel Manual—just see your Carpenter representative. The Carpenter Steel Company, 106 W. Bern Street, Reading, Pa.

Job:
Compound Blank and Draw Die for forming .031", ¼-hard brass Vent Valve Bodies at the rate of 103 per minute on a punch press.

Problem:
Unit costs were on the upswing because the old dies wore too rapidly, causing frequent and costly machine shutdowns for regrinding.

Solution:
Looking for a die steel with maximum wear resistance, the toolmaker referred to the Selector Section in the Carpenter Matched Tool Steel Manual, and quickly arrived at Carpenter *Hampden* (Oil-Wear).

Heat Treatment:
Simplified instructions in the Manual were followed.

Results:
2 hours of costly machine downtime were eliminated *each day*—production per grind *rose over 300%!* As a matter of interest, the toolmaker takes off approximately .0005" per stoning and gets about 100 grinds from the Blank and Draw Die.

IMMEDIATE DELIVERY FROM LOCAL STOCKS!

Call Your Nearest Carpenter Warehouse or Distributor

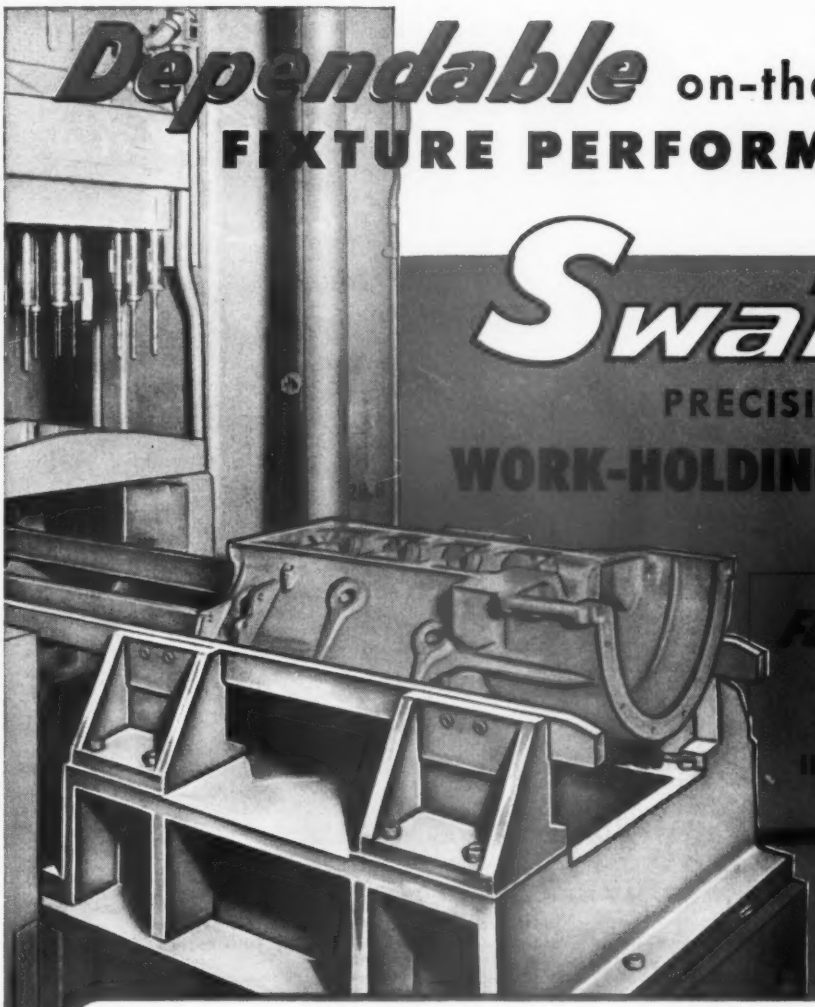
Carpenter STEEL — Matched Tool and Die Steels

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Mill-Branch Warehouses and Distributors in Principal Cities Throughout the U. S. A. and Canada

CIRCLE INFORM-A-GRAM KEY NO. 14

Dependable on-the-job FIXTURE PERFORMANCE!



Swartz

PRECISION

WORK-HOLDING FIXTURES

FOR AUTOMATIC TRANSFER and INDEX MACHINES

It's the dependable on-the-job performance of Swartz fixtures which sums up the many advantages Swartz service provides both buyer and builder of automatic machine tools. That's why Swartz fixtures were specified for this special 14-station Transfer Machine.

More than 30 years of seasoned experience and know-how, together with modern fixture-building facilities, are back of the Swartz specialized fixture-building service. It is an out-of-the-ordinary service, complete in every detail, with a number of distinct advantages . . . advantages it will pay you to investigate.

A Swartz engineer will gladly give you the facts, and point out the many ways this efficient, profitable service can be put to work for you.

WRITE TODAY FOR YOUR COPY OF THE NEW SWARTZ BROCHURE! THE INTERESTING DETAILS OF SWARTZ SERVICE ARE OUTLINED IN THIS NEW BROCHURE, "ADVANCING AUTOMATION," AND A COPY WILL BE MAILED ON REQUEST.

Designers and Builders of Precision Work-Holding Fixtures for More Than 30 Years

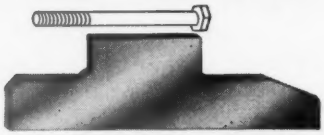
SWARTZ TOOL PRODUCTS

Division of Jefferson Corporation

13336 FOLEY AVENUE • DETROIT 27, MICHIGAN

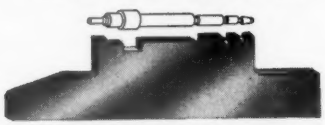
CIRCLE INFORM-A-GRAM KEY NO. 15

Talide Blades Any Size - Any Shape



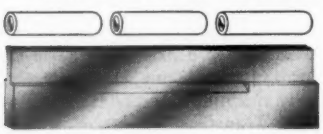
LEADING BOLT MAKER

PART.....Hardened Alloy Steel Stripper Bolt.
OPERATION.....Grind O.D. of bolt body.
MACHINE.....No. 2 Cincinnati Centerless Grinder.
BLADE.....Standard Talide-tipped Infeed work support blade No. 223877.
RESULTS.....Talide-tipped blade gave 1600 hours of continuous service compared with normal production of 20 hours obtained with high-speed steel blade.



LARGE ELECTRIC MOTOR PLANT

PART.....Stainless Steel Rotor Shaft for Electric Motor.
OPERATION.....Grind 7 diameters simultaneously.
MACHINE.....No. 2 Cincinnati Centerless Grinder.
BLADE.....Special multiple step Talide-tipped work support blade No. C-4884.
RESULTS.....Talide-tipped blade in continuous production for 91 days (2 turns per day) compared to best previous production run of 3 days with hard alloy steel blade.



LARGE MID-WEST BUSHING PRODUCER

PART.....Cast Bronze Bushing.
OPERATION.....Grind O.D. of bushing body.
MACHINE.....No. 12 Landis Centerless Grinder.
BLADE.....Standard Talide-tipped thru-feed work support Blade No. CA-32328.
RESULTS.....Talide-tipped blade maintained size without scoring or scratching while grinding 1,000,000 hard bronze bushings—previous Stellite blade wore out after grinding only 40,000.

One-piece Talide strip (up to 100" without seams) prevents scoring and scratching. Write for new 84-page Catalog 54-G or ask for sales engineer to call. Metal Carbides Corporation, Youngstown 7, Ohio.

METAL CARBIDES CORPORATION
MC
TALIDE
YOUNGSTOWN 7, OHIO

SINTERED CARBIDES · HOT PRESSED CARBIDES
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

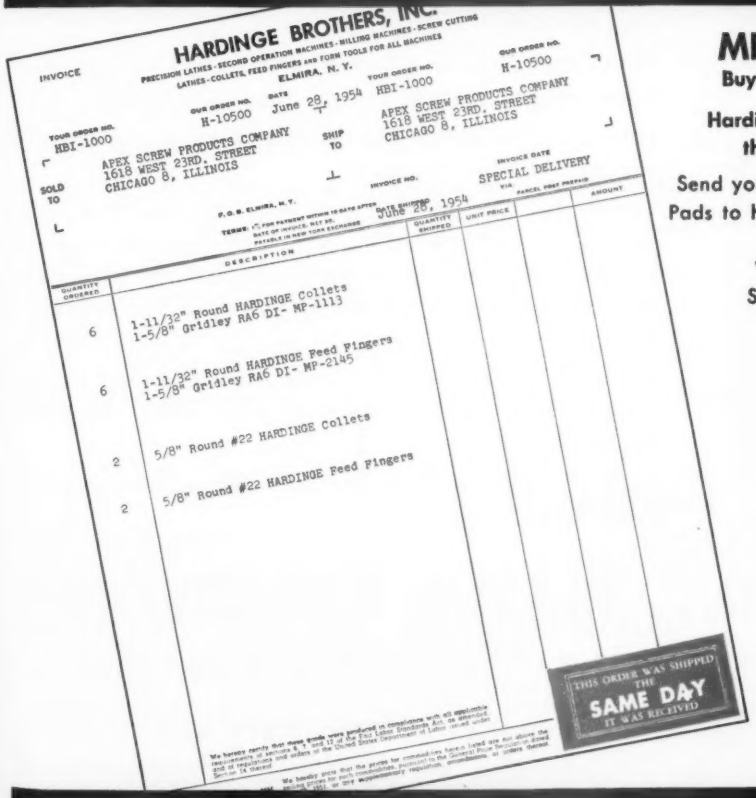
CIRCLE INFORM-A-GRAM KEY NO. 16

HARDINGE
ELMIRA, N.Y.

Collets
Feed Fingers
Pads

Shipped the Same Day

THIS ORDER WAS SHIPPED THE **SAME DAY** IT WAS RECEIVED


HARDINGE BROTHERS, INC.
PRECISION LATHES - SECOND OPERATION MACHINES - MILLING MACHINES - SCREW CUTTING LATHES - COLLETS, FEED FINGERS and FORM TOOLS FOR ALL MACHINES
ELMIRA, N. Y.

INVOICE

YOUR ORDER NO. HBI-1000 — OUR ORDER NO. H-10500 — DATE June 28, 1954 — YOUR ORDER NO. HBI-1000 — OUR ORDER NO. H-10500

SOLD TO: APEX SCREW PRODUCTS COMPANY, 1618 WEST 23RD. STREET, CHICAGO 8, ILLINOIS

SHIP TO: APEX SCREW PRODUCTS COMPANY, 1618 WEST 23RD. STREET, CHICAGO 8, ILLINOIS

INVOICE NO. — INVOICE DATE June 28, 1954 — SPECIAL DELIVERY

F.O.B. ELMIRA, N.Y. — DATE SHIPPED June 28, 1954 — VIA — PARCEL POST PREPAID

TERMS: NET 30 DAYS FROM DATE OF INVOICE, NET 30 PAYABLE IN NEW YORK EXCHANGE

QUANTITY ORDERED	DESCRIPTION	QUANTITY SHIPPED	UNIT PRICE	AMOUNT
6	1-11/32" Round HARDINGE Collets 1-5/8" Gridley RA6 DI- MP-1113			
6	1-11/32" Round HARDINGE Feed Fingers 1-5/8" Gridley RA6 DI- MP-2145			
2	5/8" Round #22 HARDINGE Collets			
2	5/8" Round #22 HARDINGE Feed Fingers			

We hereby certify that some goods were produced in compliance with all applicable requirements of sections 6, 7, and 12 of the Fair Labor Standards Act, as amended, and of regulations and orders of the United States Department of Labor issued under Section 14 thereof. We hereby price that the prices for commodities herein listed are no above the lowest prices at which such commodities are sold by us to any purchaser in the general trade area specified in the General Price Regulation issued pursuant to the Defense Production Act of 1950, as amended, or any supplementary regulation, amendments or orders issued thereunder.

THIS ORDER WAS SHIPPED THE SAME DAY IT WAS RECEIVED

MEMO TO:

Buyers of Collets, Feed Fingers and Pads

Hardinge delivers from stock, quality items that give top performance at low cost.

Send your orders for Collets, Feed Fingers and Pads to Hardinge. Watch for packing lists and invoice with the slogan imprinted "This order was Shipped the SAME DAY it was Received."

These imprinted forms are symbols of the services from Hardinge that await your orders.

Large stocks are maintained in the following distribution centers: Hartford, New York, Philadelphia, Baltimore, Elmira, Detroit, Dayton, Chicago, St. Louis, Minneapolis, Los Angeles, San Francisco.

Immediate Stock Delivery

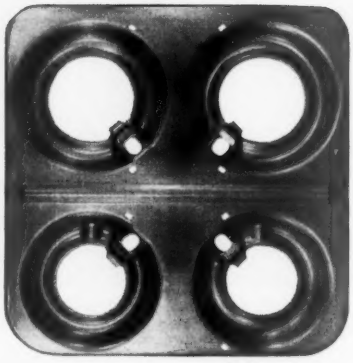
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

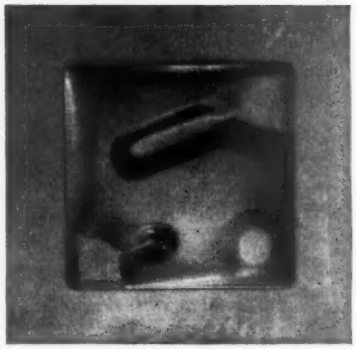
CIRCLE INFORM-A-GRAM KEY NO. 17

Plastic Low Cost Tooling

For

Dies · · · Drill, Welding, and Assembly Jigs





Vulcan, keeping pace with modern tooling, can recommend plastic tooling for medium production on numerous tool programs.

Plastic tools are light in weight, have good impact, compressive strength and dimensional stability. No hand finishing of parts required as galling or marking is eliminated by using plastic form dies.

Contours and odd shapes are cast or laminated to suit individual tools, saving expensive machine and hand finishing operations.

Plastic tools, built in a matter of days instead of weeks, lower your tool costs for those medium production runs.

Our actual production figures prove plastic has a definite place in modern production.

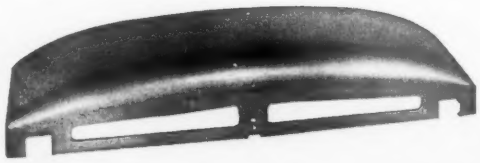
Vulcan Tool Company's organization, building fine tools since 1916, believes new tooling developments must be proved by tool engineers. Since plastic is not a cure-all your problem should be handled by recognized, practical tool men.

Our engineering staff will recommend the correct plastic material and advise if parts of your tooling program should be in plastic.

Send a part print and your production requirements for quotation and recommendations.

VULCAN TOOL CO....PLASTIC TOOL DIVISION

Pritz Street, Dayton 10, Ohio



Major Vulcan Services

Engineering, Processing, Designing and Building Special Tools . . . Dies . . . Special Machines . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and Size, Vulcanaire Jig Grinders, Plastic Tooling, Vulcan Rotary Tables.

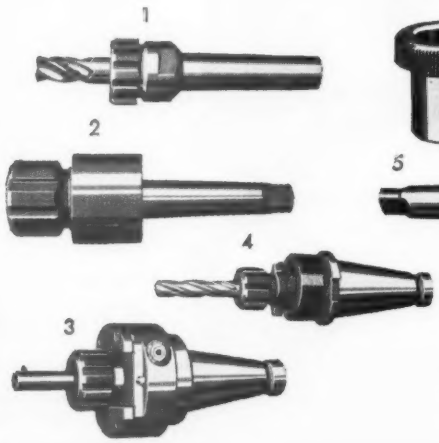
CIRCLE INFORM-A-GRAM KEY NO. 18

UNIVERSAL DRILL BUSHINGS OUTLAST THEM ALL!

Several factors contribute to the long life of Universal Drill Bushings. They are machined from an unusually high quality steel. Their superfinish bores reduce wear. The blended radius on the top inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests help guarantee their accuracy and uniform quality. Knurled heads provide a quick, sure grip. Available in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis. — or our home office.

180

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 8,
MICHIGAN

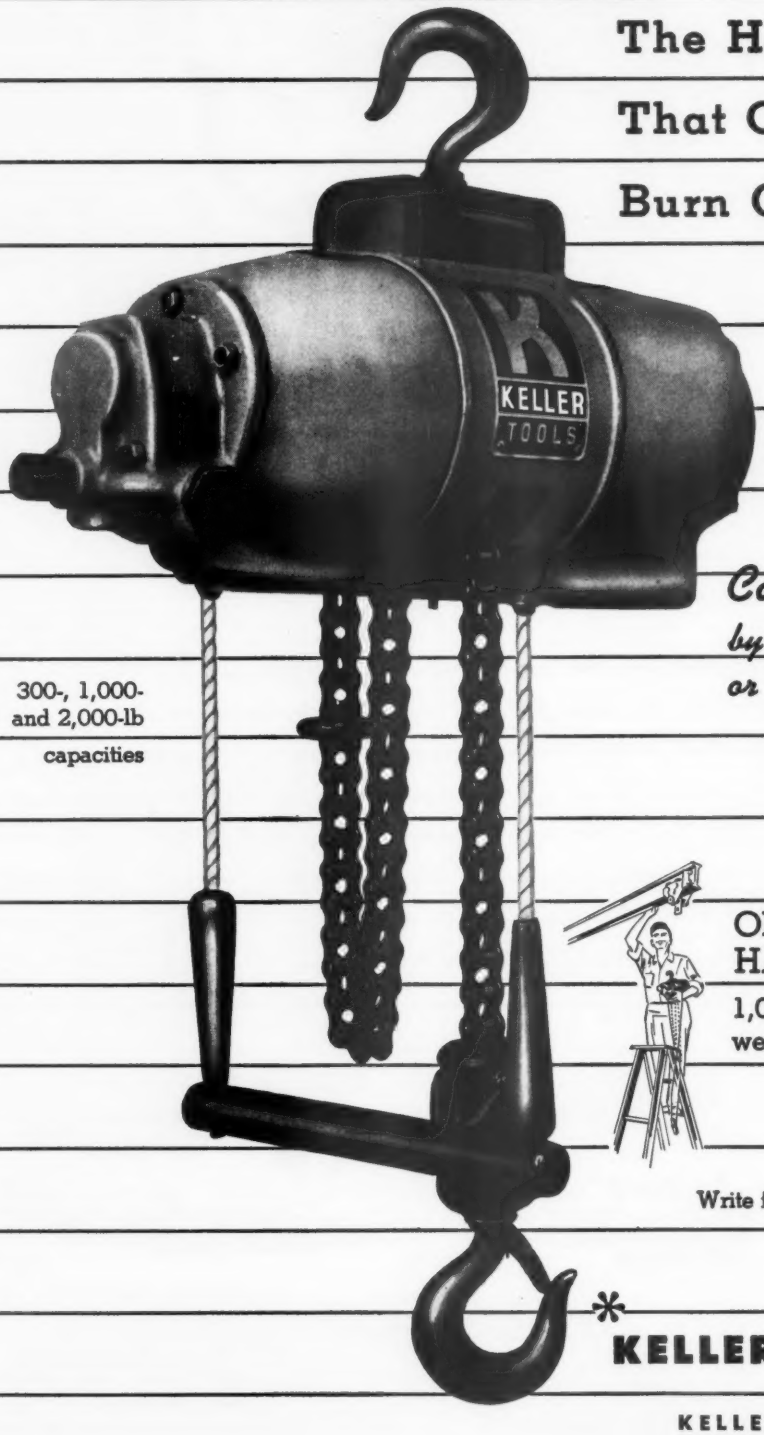


1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER

CIRCLE INFORM-A-GRAM KEY NO. 19

KELLER

The Hoist That Can't Burn Out !



Can't Overheat
from rapid reversals

Can't Be Damaged
by continuous service
or stalling under load

300-, 1,000- and 2,000-lb capacities

ONE MAN HANDLES IT EASILY

1,000-lb hoist weighs only 28 pounds

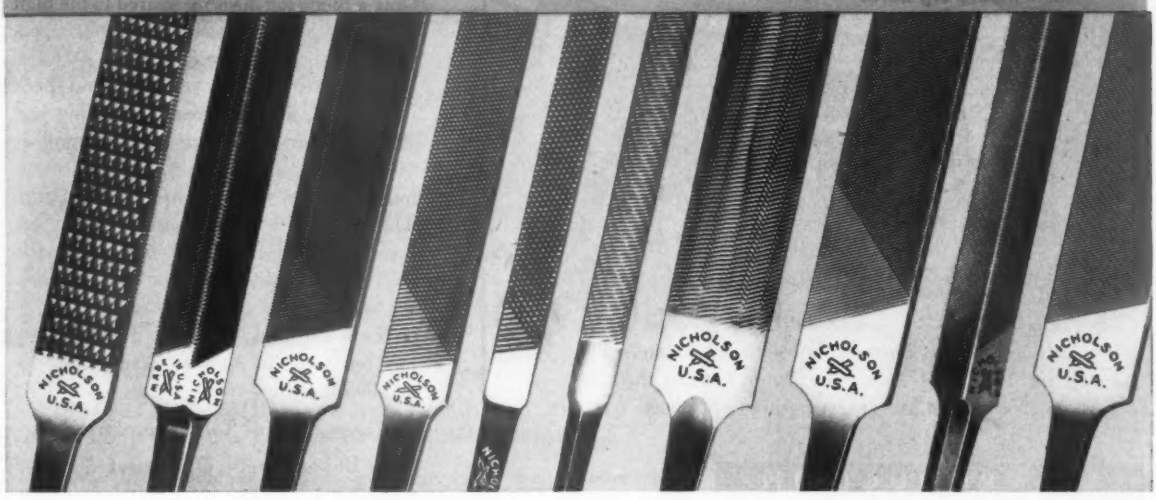
Write for Catalog 86

KELLER AIR HOISTS

KELLER TOOL COMPANY
1313 FULTON ST., GRAND HAVEN, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 20

WIDE ACCEPTANCE proves their merit



Purchasing and production heads like to do business with Industrial Distributor representatives who have "what it takes." And that, first of all, is **GOOD PRODUCTS** with **WIDE ACCEPTANCE.**

There is no better example than Nicholson or Black Diamond files. Through four generations of steadfast quality manufacture, Nicholson has gained world-wide recognition of these outstanding brands.

The variety of file types, cuts and sizes is designed for meeting the growing file requirements of modern production methods, shop practices and metals. Nicholson and Black Diamond files are meticulously made to remove the most metal in the shortest time. They provide the means to save workmen's time and bring filing costs down to an irreducible minimum.

With an all-time-high user acceptance supporting Nicholson and Black Diamond, why not put all your filing needs under the smooth guidance of your nearest Nicholson industrial distributor?

NICHOLSON FILE COMPANY
95 Acorn Street, Providence 1, R. I.
(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

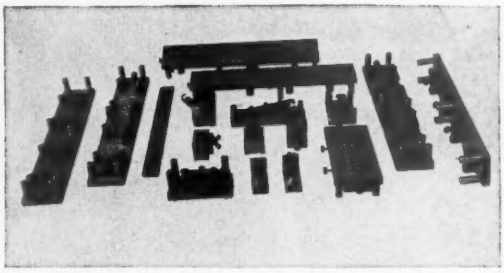
NICHOLSON FILES *FOR EVERY PURPOSE*

CIRCLE INFORM-A-GRAM KEY NO. 21

YOU GET *SPEED* PLUS ACCURACY WITH MOORE JIG BORERS

IN THE TOOLROOM

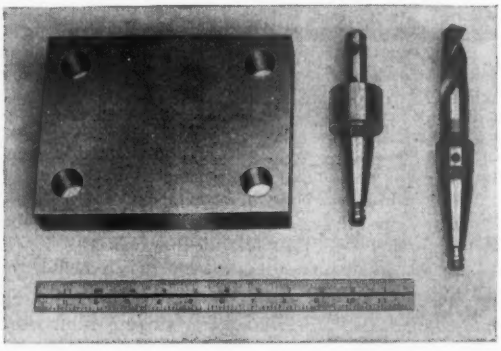
400 holes to "tenths"—5 to 7 minutes each on the No. 1 Moore Jig Borer



Manufacture of this group of drill jigs involves accurately locating, drilling and boring approximately 400 holes. The No. 1 Moore Jig Borer finished them to "tenths" in from five to seven minutes per hole.

ON PRODUCTION

64 holes to ±.0002"—2 minutes each on the No. 2 Moore Jig Borer

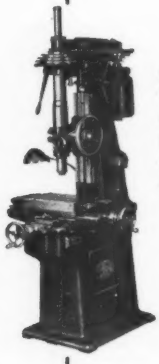


Sixteen pieces like this were located, drilled, bored and checked on a No. 2 Moore Jig Borer with one drill and one carbide bit. The 64 holes were finished in 2 hours and 8 minutes (plus 30 minutes setup) with location and size tolerances ± .0002".

Only a precision machine geared to the high American production standards of ruggedness *and* accuracy can meet these performance requirements. For versatility and speed in spotting, drilling, reaming, boring and checking operations in production as well as tooling, no other moderately-priced machine tool compares with the Moore Jig Borer. And there's no sacrifice of accuracy for speed, since the lead screw measuring system built into each Moore machine permits working to the closest of tolerances.

You'll find that the Moore Jig Borer can pay for itself—*in jig time.* Write today for detailed bulletins.

Moore Special Tool Company, Inc.
726 Union Avenue, Bridgeport 7, Conn.



NO. 1 MOORE JIG BORER
Table working surface of 10"x16". Over 1200 now in use throughout the world. The ideal small, accurate jig borer. Lead screws accurate to .0002" in 16".

NO. 2 MOORE JIG BORER
Table working surface of 10"x 19". Heavier cuts, larger holes. Features infinitely variable spindle speeds, three power feed ratios, centralized control panel.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

see our catalog in MACHINE TOOL CATALOGS or write for copy

CIRCLE INFORM-A-GRAM KEY NO. 22

In STRETCH FORMING the SWING is to the BATH PROCESS

YOU GET EXTRA VALUE when you stretch form on the BATH RADIAL DRAW FORMER

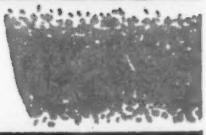
1. BECAUSE compound shapes can be produced that are otherwise unobtainable at such low cost per part.

2. BECAUSE stretch-wipe work can be held to machining tolerances.

3. BECAUSE accurate shapes can be formed in hard-to-work alloys at a fraction of the cost and time involved in machining castings or forgings.

4. BECAUSE such parts are being made for Jet Engines, Guided Missiles, Truck, Trailer and Airplane sections, lighter and stronger and without the need for subsequent high cost and unsatisfactory hand working.

5. BECAUSE many parts requiring two or three sections and subsequent welding and dressing can be made in one surprising piece.



Mail coupon for one or both of these descriptive catalogues.

THE CYRIL BATH COMPANY

MANUFACTURERS of METAL FORMING MACHINERY

32380 AURORA ROAD . . . SOLON, OHIO

(Located in the Greater Cleveland Area)

THE CYRIL BATH COMPANY, 32380 Aurora Road, Solon, Ohio

Gentlemen: Please send me your free catalogue on

☐ Radial Draw Forming (CF-762) ☐ Contract Forming (CFP-530)

without obligating me in any way.

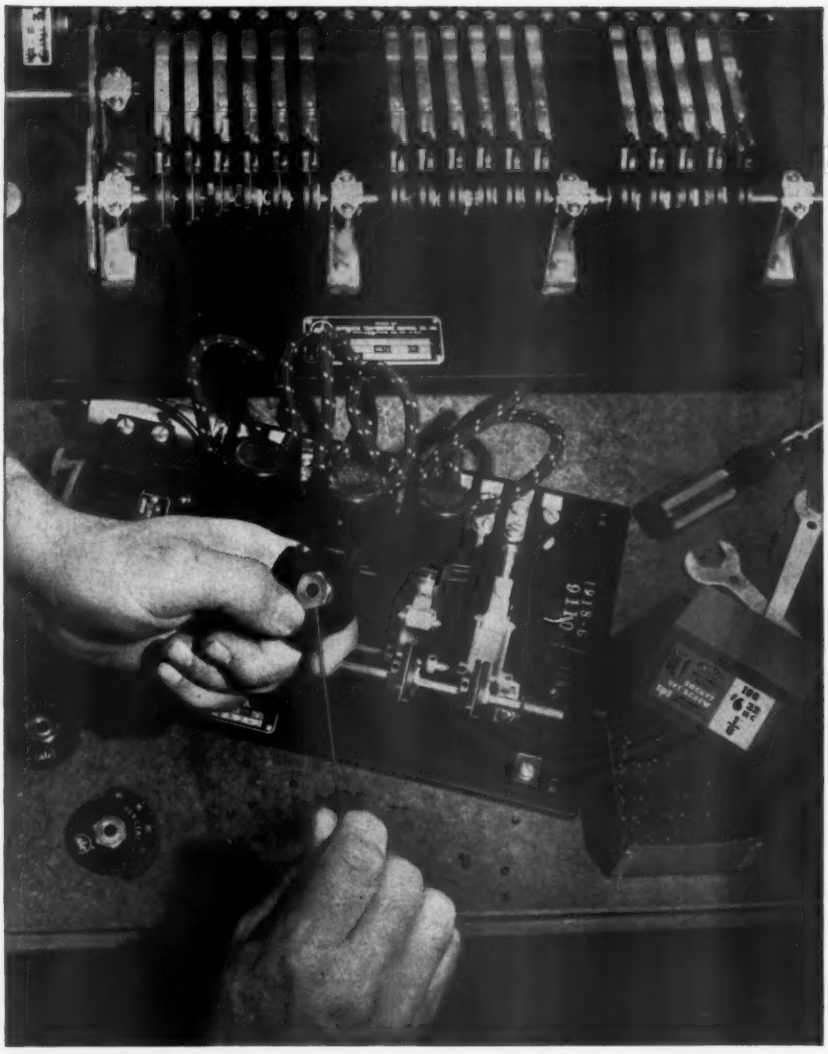
NAME_____

COMPANY_____

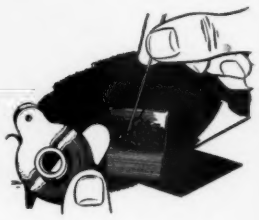
ADDRESS_____

CITY_____ ZONE_____ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 23



Two UNBRAKO Self-Locking Socket Set Screws are used on each cam of these precision multicircuit cam timers. The screws position the cams so as to control accurately the sequence and duration of one or a series of individually timed machine or process operations.



Assembler picks up tiny UNBRAKO set screw with long arm key preparatory to threading it into cam assembly.

He inserts the UNBRAKO, and turns it into the assembly; then after positioning cam, tightens it. The accurate depth and size of the hex socket result in maximum torquing—the knurled cup point holds the cam accurately in place.

UNBRAKOS—made of heat treated alloy steel—have fully formed threads, Class 3 fit; are supplied in standard sizes from #4 to 1".

You'll need less space for storage when you use UNBRAKO Standards—stocked by your distributor

You'll need less space for storage and be able to carry a smaller inventory, because standard UNBRAKO socket screw products are in stock at your local industrial distributor's. And you'll save time and money, because deliveries are prompt. For more information, write for UNBRAKO Standards—a complete listing of socket screw products made by the world's largest manufacturer of these precision fasteners. STANDARD PRESSED STEEL Co., Jenkintown 36, Pa.

UNBRAKO® SOCKET SCREW DIVISION

SPS JENKINTOWN PENNSYLVANIA

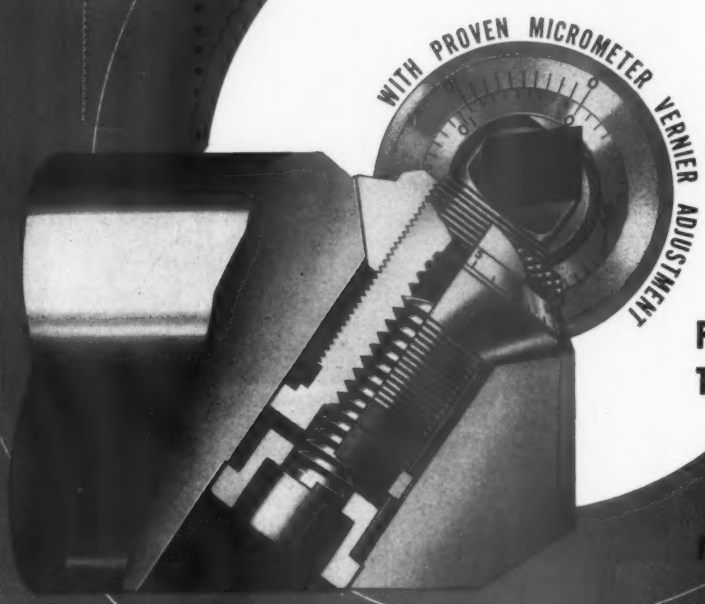
Flat Head Cap Screw | Shoulder Screw | Knurled Head Cap Screw | Dowel Pin | Button Head Socket Screw

CIRCLE INFORM-A-GRAM KEY NO. 24

Microbore...

PATENT NOS. 2,330,692
2,537,517

"The Multi-Purpose Single Point Adjustable Tool"



For Precision Boring, Turning and Facing Operations!

Maximum rigidity for the efficient application of carbides.

Production Applications: A complete service is available for engineering and manufacturing Microbore Equipment for production operations.

General Purpose Work: A wide range of Standard Microbore Boring Bar Sets is available for Tool Work and general purpose boring.

For the latest developments in precision tooling consult

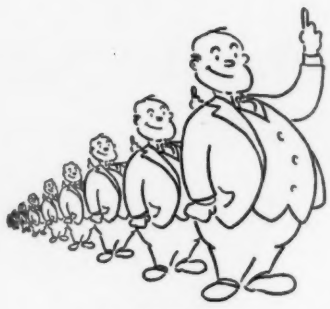
DE VLIEG of DETROIT

DE VLIEG MICROBORE CO. 480 Fair Avenue • Ferndale 20, Michigan, U.S.A.

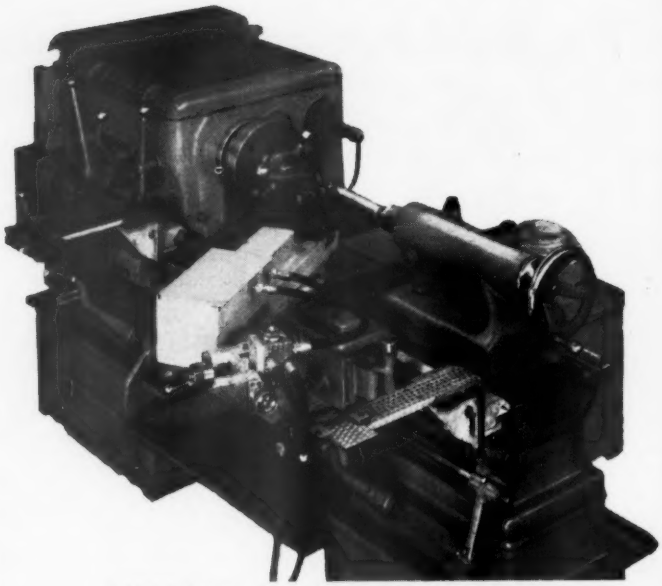
Send for Illustrated Catalog

CIRCLE INFORM-A-GRAM KEY NO. 25

TRACER CONTROLLED MACHINING APPLIED TO THE LATHE



Mr. Duplicator



A NEBEL Lathe equipped with a WALKER Duplicator

MR. DUPLICATOR SAYS—"Walker, a lot of machine tools are being redesigned and many new features added to modernize them, do you come into this picture with your Duplicator?"

WALKER SAYS—"Yes, in the redesigning of lathes the trend is definitely towards automation. Our Duplicators play a very prominent part in these new design features. This is brought out very prominently in the redesigning of the NEBEL lathe, which has been built for over 50 years. The trend toward automation is evidenced by the increased demand for hydraulic Duplicators on NEBEL lathes. All NEBEL lathes can be supplied with hydraulic Duplicators as standard equipment, if the customer so desires. We furnish hydraulic Duplicators for the NEBEL lathe and many other manufacturers buy our Duplicators and put them on as standard equipment."

WALKER LEADERSHIP in this field is evidenced by the many repeat orders and requests that we have from prominent manufacturers for our Duplicators. Definitely we are an authority on Duplicating and are recognized as such. We put our Duplicators on such other machines as: Boring Mills (horizontal or vertical), Planers, Shapers, Grinders, and Special Machines.

WALKER DUPLICATORS have increased production from 3 to 20 times. They are simple in design, accurate in construction, and their reliability is beyond question. Huge machines or small machines, they all have our Duplicators on them. Send us a print of the part to be made, size and make of machine to be MODERNIZED and we will send you an understandable quote. You'll be surprised how little these Duplicators cost in comparison to the returns.

WALKER DUPLICATORS incorporate the latest design features. In our approximately 25 years of manufacturing Duplicators many designs that we have discarded are being revived by others. We are continually bringing out new features. These new features will play a prominent part for us in the very near future. You get only the newest ideas and the best in design when you buy WALKER DUPLICATORS! Let us help you! Write or call us today! Phone: 7871.

REPRESENTATIVES IN PRINCIPAL AREAS

Walker HYDRAULIC DUPLICATOR CO.

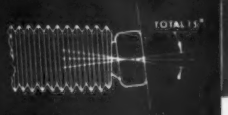
P. O. Box 465 STANDISH, MICHIGAN

Pioneer Designers and Builders of Precision Duplicating Equipment

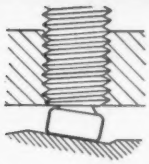
CIRCLE INFORM-A-GRAM KEY NO. 26

Here's the secret to positive clamping... freedom from marring!

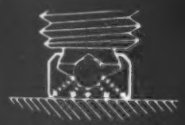
the New Vlier SCREW-BALL CLAMPS!



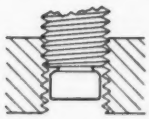
Ball-bearing construction insures frictionless, *automatic* angle adjustment and rotation; pad swivels freely in *all* directions up to 7½° from the centerline!



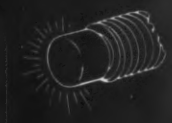
Pad seats firmly on work surface within angular range!



Force distributed equally to pad face. Conical seat distributes force equally in all directions; insures easy alignment in angular applications; greater freedom of motion.



Pad inserts from top of threaded hole or from bottom for easy installation!



Large pad area. Pad is machined from the solid, not counterbored or relieved; has greater strength plus freedom from distortion!

NO MORE EXPENSIVE, CUSTOM-MADE SWIVEL PADS . . . 17 size variations; ¾" O.D. up. N.C. threads; class 2 fit.

LOW COST... Saves hundreds of dollars annually in toolmaker's time!

NO MARRING... Rotation of pad ceases at first touch against the work! Soft seat saves surfaces!

HEX SOCKET HEAD... for easy hex key adjustments!

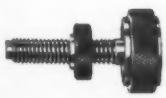
BLACK AS THE ACE OF SPADES! Completely rust proofed end to end!

KEEP VLIER SCREW-BALLS IN STOCK FOR INSTANT USE—SAVE YOUR TOOLMAKER'S TIME!

Ask your Vlier Distributor for an assortment of sizes today!

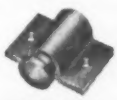
VLIER ENGINEERING INCORPORATED

MONEY-SAVING TOOLING SPECIALTIES FOR EVERY REQUIREMENT!



TORQUE THUMB SCREWS— Apply accurate, controlled end pressures; eliminate distortion to the workpiece. 4 models; 19 sizes!

VLIER SPRING PLUNGERS— For use wherever accurate, positive spring loads are needed! 4 models; 40 sizes!



VLIER SPRING STOPS— Provide end pressures in fixtures when wall sections are not available. Two models: 14 and 32 lbs. end pressure.

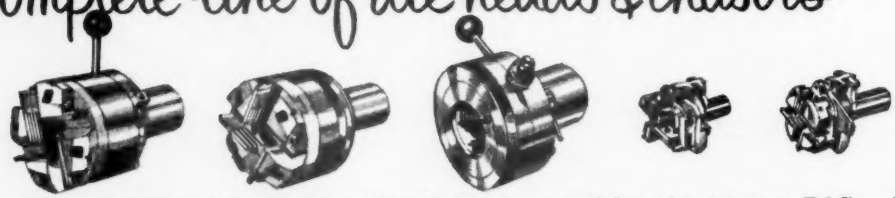
VLIER TOGGLE PADS— Assure solid clamping of parts with uneven or off-angle surfaces. 5 sizes; fit almost any clamp.

VLIER FIXTURE KEYS— New 5-Way Key fits every standard mill table slot. 3-Way model also available.

Write for your complete catalog of Vlier products today! It's free!

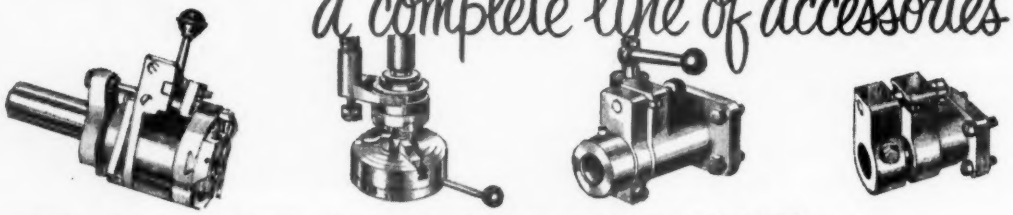
Jones & Lamson offers...

a complete line of die heads & chasers



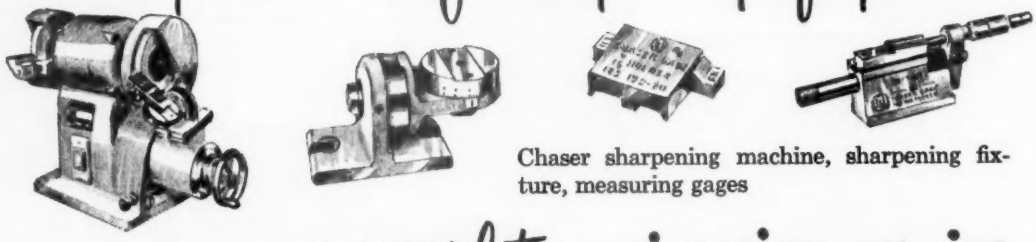
Automatic opening tangent stationary and revolving types, radial stationary type, B&S and small turret lathe types

a complete line of accessories



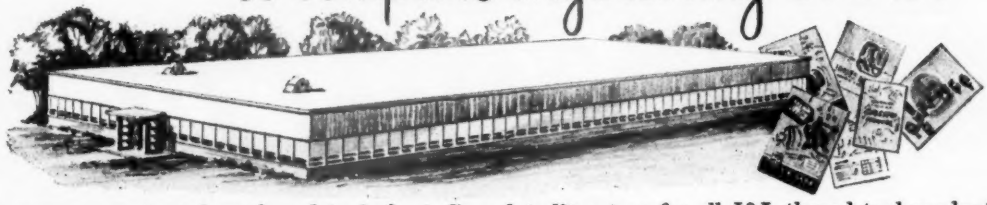
External and internal trip attachments, drill press adapter, floating holders

a complete line of sharpening equipment



Chaser sharpening machine, sharpening fixture, measuring gages

a complete engineering service



World's newest, most modern thread tool plant. Complete literature for all J&L thread tool products

J&L Automatic Opening Die Heads and Chasers assure: low initial cost — ease of operation — controlled resharpening — use of carbide where applicable. Class III threads guaranteed. This means important savings regardless of your tolerance requirements. Write to Dept. 710 for complete information.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 519 Clinton St., Dept. 710, Springfield, Vt., U.S.A. THREAD TOOL DIV.

CIRCLE INFORM-A-GRAM KEY NO. 28

a hole here is a nuisance...

a hole here is an advantage

Crucible Hollow Tool Steel Bars are saving time and money for more and more members of the metalworking industry. By using these hollow bars you eliminate drilling and boring operations, increase machine capacity and cut scrap losses.

Now, you can get hollow bars of any of Crucible's famous tool steel grades, in almost any combination of O.D. and I.D. sizes. And you can get *immediate* delivery of five popular grades from your local Crucible warehouse—KETOS® oil-hardening, SANDERSON® water-hardening, AIRDI 150® high carbon—high chromium, AIRKOOL® air-hardening, and NU DIE V® hot-work tool steels.

Your Crucible representative can point out ways to save time and money by using Crucible Hollow Tool Steel Bars.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **HOLLOW TOOL STEEL**

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 29

Newest Press Room Time-Saver!

If you are interested in obtaining the advantages of automation in your press room, the newest U. S. Automatic Coil Cradle can help make your press room operations faster and more efficient.

This cradle has a capacity for material up to 9 inches wide, in coils with an O.D. up to 40 inches. It is equipped with two coil rest rolls mounted on self-aligning roller bearings. A pair of hardened and ground power-driven take-out rolls unwind the material to the very end of the coil. The ¼ HP geared motor provides output up to 52 feet per minute, and is started and stopped through a mercury switch loop control. Motors can be furnished to provide even higher output if required.

For further time savings, the unit has been designed so that it is a simple matter to place a coil in position without having to raise it to a considerable height, or remove and replace retaining arms, as would be necessary if a stock reel were used.

If you have press room production problems, send for a copy of Bulletin 80-P. From the complete line of U. S. Automatic Press Room Equipment it describes you can find profitable, practical solutions to many of your production problems.

U. S. AUTOMATIC
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Builders of U. S. Multi-Slides — U. S. Multi-Millers

U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

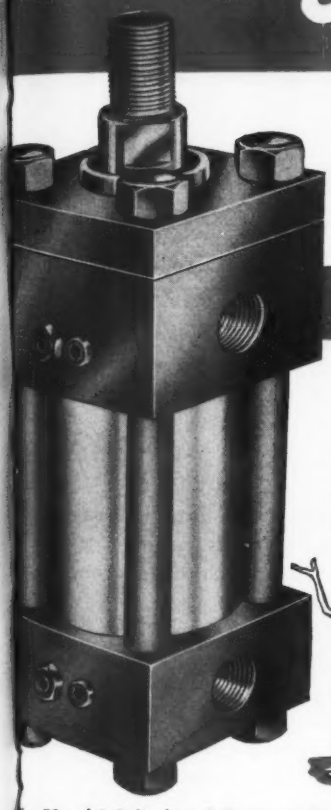
CIRCLE INFORM-A-GRAM KEY NO. 30

Augmenting Miller's Quality-Famous Line of "Custom-Built" Cylinders...

Miller Stock AIR AND HYDRAULIC CYLINDERS

Available for *Immediate Delivery*...

in the popular sizes, mountings and prices listed below



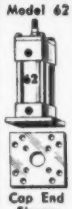
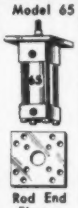
Any of the *Interchangeable* "Stock" Mountings illustrated are attached by our factory to the "in-stock" Basic Model 53 with the tie rod nuts in a few moments. This gives you a selection of over 500 different "Stock" Cylinders for *immediate use*—and permits easy conversion to other models for *future re-use*. Thus, you save delivery and production time, investment cost and storage space.

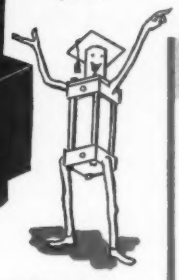
PRICES OF MILLER "STOCK" CYLINDERS WITH MOUNTINGS ATTACHED AS ILLUSTRATED

(Prices on the separate mounting attachments for future re-use are available on request)

ORDER DIRECTLY FROM THIS LIST . . .

Shipment can be generally made within 24 hours after we receive your order. Prices are F. O. B. our plant.

			Basic Model 53		Model 77	Model 61	Model 62	Model 65	Model 66	Model 86
										
			Tie Rod Mounting		Foot Mounting	Rod End Flange	Cap End Flange	Rod End Flange	Cap End Flange	Pivot Mounting
Bore	Stroke	Cushion	AIR A53	HYD. H53	AIR A61 A77	HYD. H61 H77	AIR A62	HYD. H62 H65	AIR A66	HYD. H66 H86
1½"	2"	Non		$ 58.50		$ 61.40		$ 66.70		$ 72.85
1½"	4"	Non		60.70		63.60		68.90		75.05
1½"	6"	Non		62.90		65.80		71.10		77.25
1½"	8"	Non		65.10		68.00		73.30		79.45
1½"	11"	Non		68.40		71.30		76.60		82.75
2"	2"	Non	$ 37.70		$ 39.75		$ 42.30		$ 44.60	
2"	4"	Non	39.40		41.45		44.00		46.30	
2"	6"	Non	41.10		43.15		45.70		48.00	
2"	8"	Non	42.80		44.85		47.40		49.70	
2"	11"	Non	45.35		47.40		49.95		52.25	
2"	3"	Both	62.05	94.50	64.10	97.45	66.65	103.05	68.95	111.55
2"	5"	Both	63.75	97.00	65.80	99.95	68.35	105.55	70.65	114.05
2"	7"	Both	65.45	99.50	67.50	102.45	70.05	108.05	72.35	116.55
2"	9"	Both	67.15	102.00	69.20	104.95	71.75	110.55	74.05	119.05
2"	13"	Both	70.55	107.00	72.60	109.95	75.15	115.55	77.45	124.05
2½"	2"	Non	41.45	73.30	43.70	76.25	46.25	82.30	49.00	93.10
2½"	4"	Non	43.35	76.00	45.60	78.95	48.15	85.00	50.90	95.80
2½"	6"	Non	45.25	78.70	47.50	81.65	50.05	87.70	52.80	98.50
2½"	8"	Non	47.15	81.40	49.40	84.35	51.95	90.40	54.70	101.20
2½"	11"	Non	50.00	85.45	52.25	88.40	54.80	94.45	57.55	105.25
3¼"	3"	Both	77.80	126.85	80.35	131.20	84.15	138.60	87.70	149.95
3¼"	5"	Both	79.80	129.85	82.35	134.20	86.15	141.60	89.70	152.95
3¼"	7"	Both	81.80	132.85	84.35	137.20	88.15	144.60	91.70	155.95
3¼"	9"	Both	83.80	135.85	86.35	140.20	90.15	147.60	93.70	158.95
3¼"	13"	Both	87.80	141.85	90.35	146.20	94.15	153.60	97.70	164.95
4"	2"	Non	56.25	106.00	59.10	111.15	62.95	118.90	67.30	132.80
4"	4"	Non	58.85	109.40	61.70	114.55	65.55	122.30	69.90	136.20
4"	6"	Non	61.45	112.80	64.30	117.95	68.15	125.70	72.50	139.60
4"	8"	Non	64.05	116.20	66.90	121.35	70.75	129.10	75.10	143.00
4"	11"	Non	67.95	121.30	70.80	126.45	74.65	134.20	79.00	148.10
5"	3"	Both	98.25		101.40		105.25		110.60	
5"	5"	Both	101.65		104.80		108.65		114.00	
5"	7"	Both	105.05		108.20		112.05		117.40	
5"	9"	Both	108.45		111.60		115.45		120.80	
5"	13"	Both	115.25		118.40		122.25		127.60	
6"	2"	Non	80.60		83.95		87.85		94.15	
6"	4"	Non	84.90		88.25		92.15		98.45	
6"	6"	Non	89.20		92.55		96.45		102.75	
6"	8"	Non	93.50		96.85		100.75		107.05	
6"	11"	Non	99.95		103.30		107.20		113.50	
8"	3"	Both	157.35		161.05		167.90		174.95	
8"	5"	Both	162.45		166.15		173.00		180.05	
8"	7"	Both	167.55		171.25		178.10		185.15	
8"	9"	Both	172.65		176.35		183.20		190.25	
8"	13"	Both	182.85		186.55		193.40		200.45	



ller "Stock" Cylinders fully meet the J.I.C. ndards and are identical to Miller "Custom- t" Cylinders in design and construction.

ck" Air Cylinders are for 200 psi opera- , "stock" hydraulic cylinders for 2000-3000 peration. Piston Rods of "Stock" Cylinders "Style No. 2 Standard."

complete descriptive and dimensional on both "Stock" and "Custom-Built" Miller nders, write for Bulletins A-105 and H-104 FREE on request.

Sales and Service From Coast to Coast!

Consult your local directory or write us direct for the name of our representative for your area

"Stock" Boosters, Tool Immediate delivery on Miller Dual Pressure Boosters; 5" bore, 1" ram (80 psi air input produces 2000 psi hydraulic output for driving one or more work cylinders simultaneously). In 6" and 12" strokes. Write for data and prices.

plete Miller "custom-built" line includes: air cylinders, 1½" to bores, 200 psi operation; low pressure hydraulic cylinders, " to 6" bores for 500 psi operation, 8" to 14" bores for 250 psi ration; high pressure hydraulic cylinders, 1½" to 12" bores, 0-3000 psi operation. All mounting styles available. Also, a plete line of Fluid Pressure Boosters and Accumulators.

MILLER FLUID POWER CO.

(Formerly MILLER MOTOR COMPANY)

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AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

Only GRAPH-MO® combines these advantages in one tool steel

Outwears other tool steels 3 to 1
Machines 30% faster
Is the most stable gage steel ever made

HERE'S how you can produce gages or dies in less time and make them stay accurate longer. Use Graph-Mo® graphitic tool steel. It's the only steel that gives you the combination of advantages you want most in a tool steel—excellent wearability, excellent machinability and excellent stability.

Free graphite and diamond-hard carbides in the structure of Graph-Mo tool steel give it unusual life. Reports from dozens of users show that Graph-Mo steel outwears other tool steels 3 to 1. And because the graphitic particles act as a "built-in" lubricant, Graph-Mo steel machines 30% faster than other tool steels.

This Graph-Mo tool steel master plug gage showed less than 10 millionths of an inch change during 12-year test period.

Tests prove that Graph-Mo steel is the most stable gage steel made. For instance, after a 12-year period a typical Graph-Mo steel master plug gage showed less than 10 millionths of an inch change from its original dimensions.

Graph-Mo steel also has minimum tendency to pick up, scuff or gall and gives excellent resistance to abrasion. Tests on Amsler wear machine prove that Graph-Mo steel has twice the resistance to galling when compared with ordinary tool steels.

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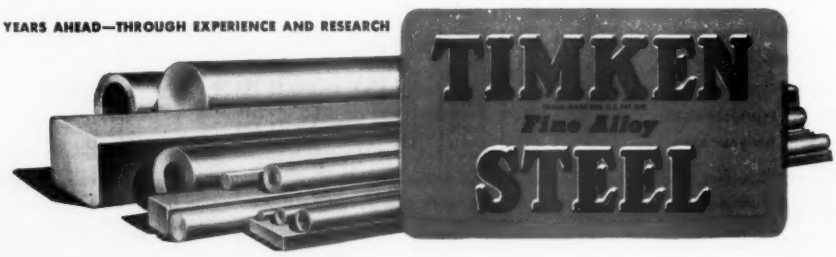

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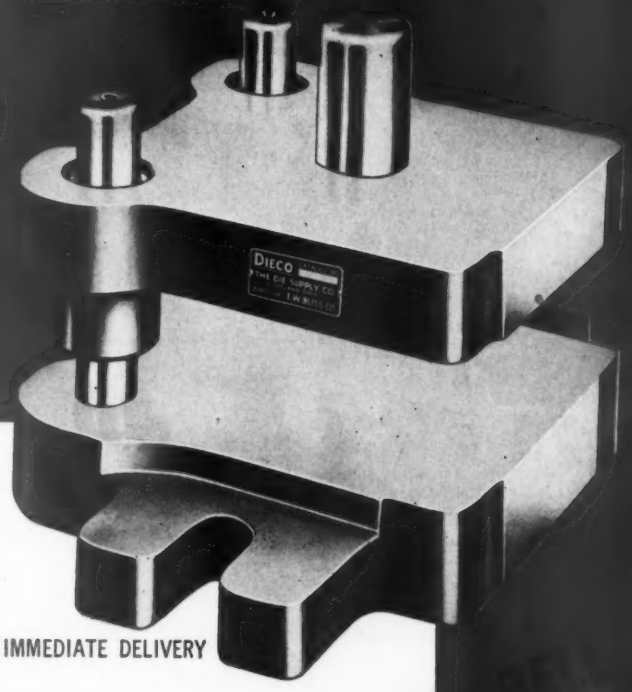

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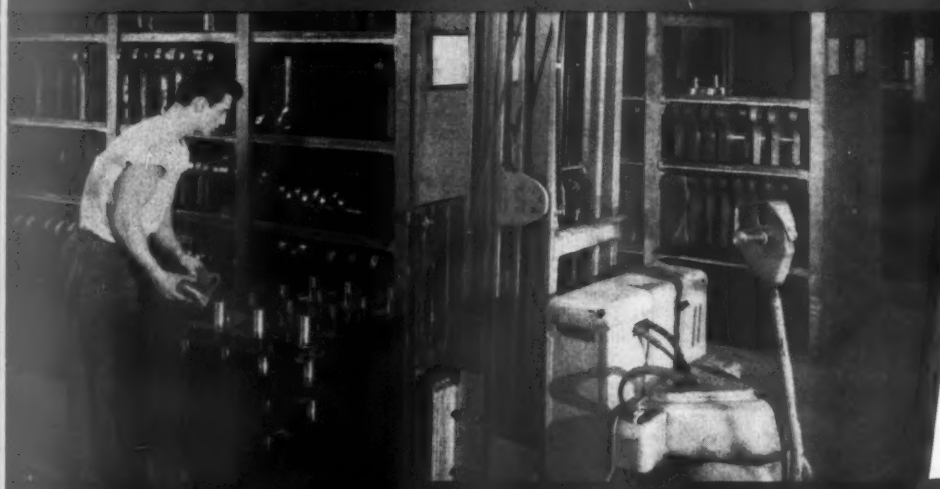

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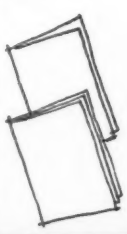

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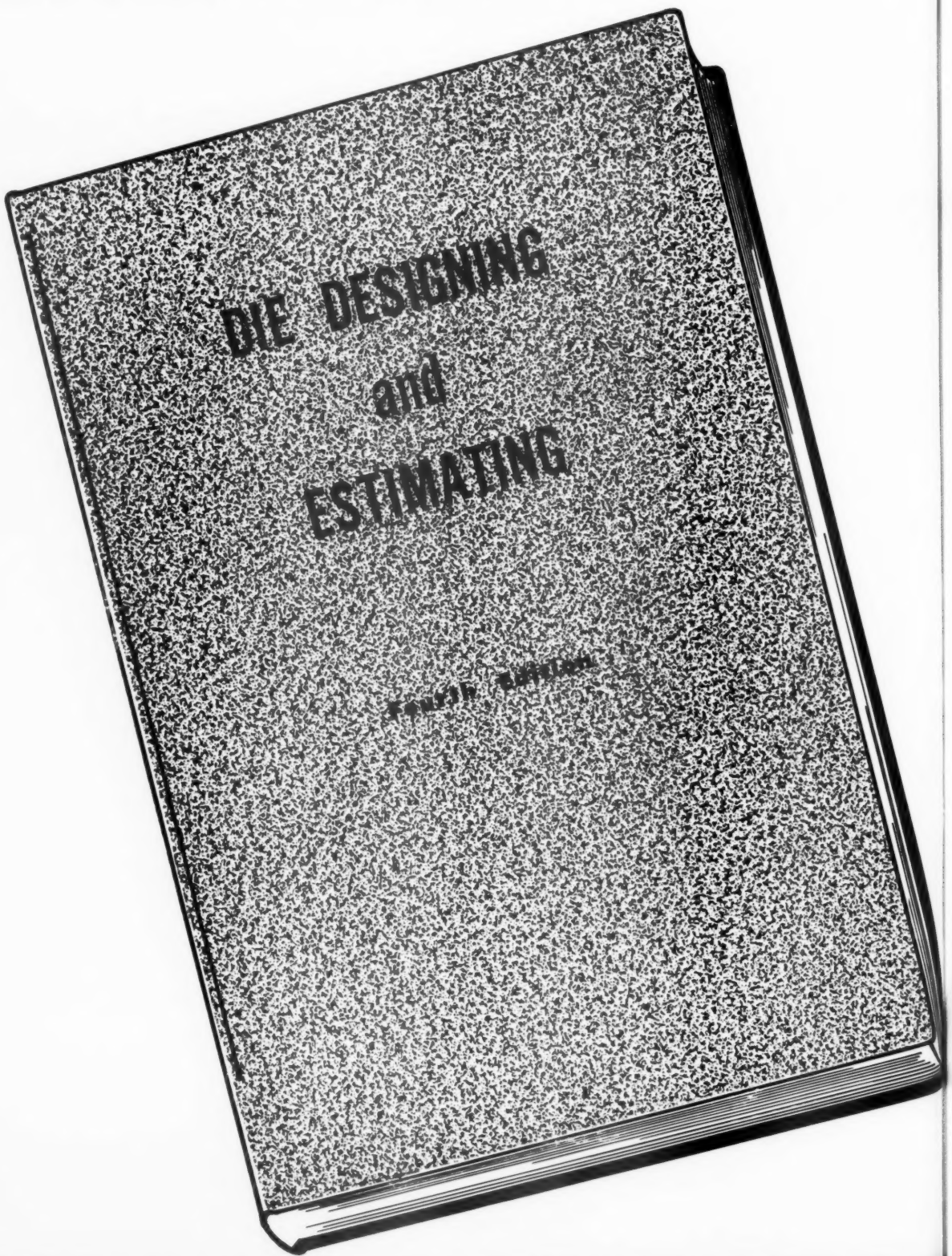

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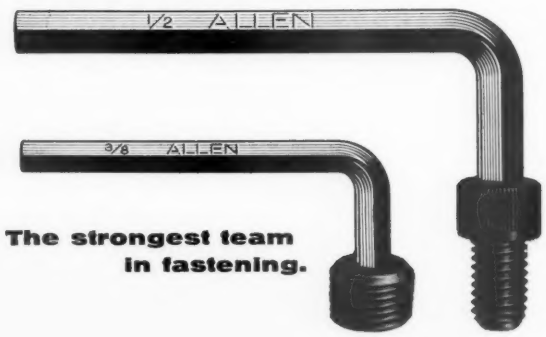

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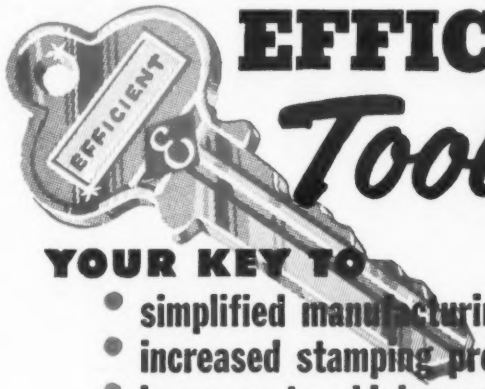

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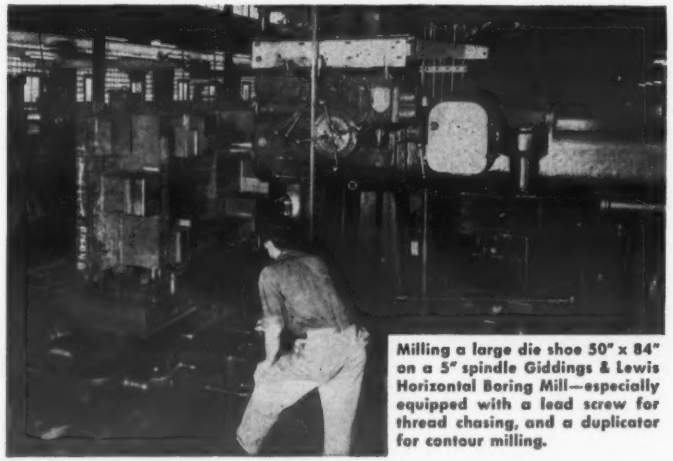

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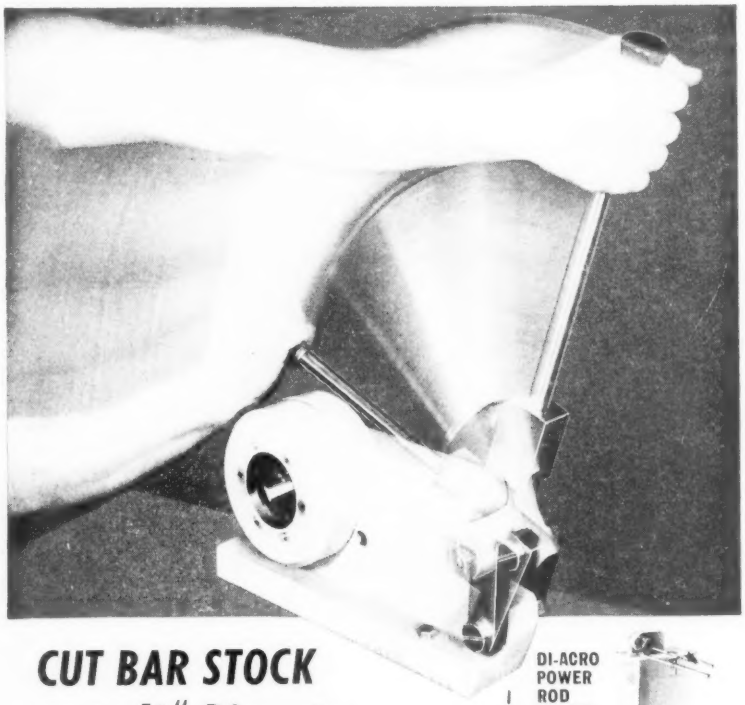

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WATCH FOR THIS IN SEPTEMBER

"HOW TO INCREASE PRODUCTION"

An article built on a great variety of milling, grinding and broaching operations as performed on standard and special purpose machine tools. It will tell how certain elements of automation are incorporated in the tooling and fixturing in order to "keep the machine cutting as much of the time as possible." These automation features include automatic cycling, power operated fixtures, transfer mechanisms, loading devices, and combined operations.

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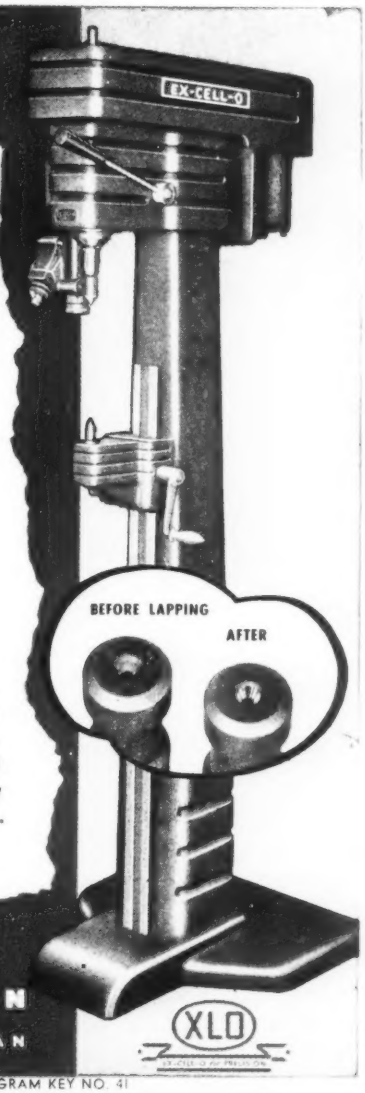

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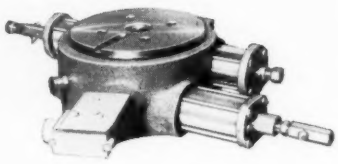

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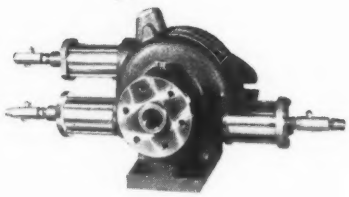
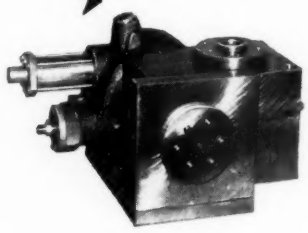


MODELS 400 and 600 ERICKSON SPEED INDEXERS Standard index plate provides 4, 6, 8, 12 and 24 positions. Special indexing parts are available to provide up to 100 positions. Two mounting surfaces provide for vertical or horizontal mounting.



MODEL 477 ERICKSON MULTIPLE POSITION INDEXER accurately indexes up to 500 positions, depending on the gear ratio and index plate employed. Since gear box turns on indexer spindle, unit can be operated in any angle from 0 to 90°. Units are made to customers' requirements.

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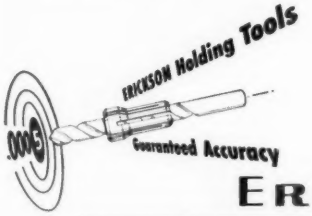

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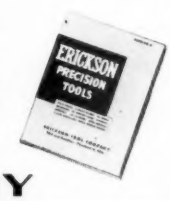

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today's look at quality control

Quality control programs are growing in number of applications and in extensiveness of application. This is resulting in the installation of more and more measuring, testing and inspecting equipment for the purpose of eliminating the elements of human error and judgment in the exercise of control over production quality.

Not only is much of this equipment being mechanized to the nth degree but there are increasing instances of its being integrated into the production line proper. Automatic measuring and control right at the work spindle act to preclude the production of offsize parts, thus eliminating the non-productive chore of selection after the parts come from the machine.

To date, much quality control thinking has been predicated upon production and assembly economics: the cost advantages that derive from less scrap in production and fewer misfits in assembly.

During the past year a very significant and important factor has become of increasing influence in manufacturing management's attitude toward, and support of, quality control programs. That factor comes under the heading of "customer complaints" and is one which no manufacturing enterprise can ignore and hope to continue being among those present.

The postwar sellers' market has gone by the boards. Today the customer reigns supreme. Any dissatisfaction with product quality — material or performance — becomes a howl that is heard clear and loud in the front office.

Whether it concerns a portable swimming pool or a load of sheet stock for the press department, each and every customer complaint contributes its share to the resistance encountered by the sales department.

One of industry's largest materials suppliers has invested thousands of dollars in a sound and color film which dramatizes the inordinate expense of handling customer complaints. This movie, for showing only within the organization but at all levels, from manufacturing management to machine operators, pinpoints for every department just what strict adherence to good quality control procedures can do toward lessening customer complaints and the attendant loss in dollars and man-hours.

The chief quality control engineer for a large manufacturer of a variety of products recently told us that since his management had become more "customer complaint conscious" there had been a sufficient loosening of the purse strings so that he was able to expand the facilities and functions of his department.

The strongest supporting evidence of all, however, as to the influence which customer complaints have upon the installation of quality control equipment and procedures, lies in the many examples of plants which have exercised little or, at best, half-hearted control over product quality, and which are now getting into it with both feet. They have realized that it is later than they thought.

Our 7th Annual QUALITY CONTROL Feature Issue will be in your hands in a short sixty days — October.

Its editorial content in diversity of subject matter and in detailed presentation of technical know-how is shaping up to be the most complete and satisfying of all our QUALITY CONTROL Annuals.

It will be of great on-the-job interest to all readers, whether they be Q-C neophytes or advanced workers. It will answer such questions as when and for how long to chart a machine's performance; the how and why of air gages; how to do the most with optical inspection methods; how Q-C charts can stimulate pride in craftmanship; how to set up for incoming materials inspection; and how to initiate a quality control program; all based on the practical experiences of our authors who have learned the hard way.

It is noteworthy, and in perfect keeping with the importance of quality control to our readers and advertisers alike, that the last five of our six QUALITY CONTROL Annuals have been the biggest issues in each of those years. That this record will hold for 1954's 7th as well, is already assured.

E. Willard Pennington

editor

by Nyles V. Reinfeld
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Do You Want . . .

PRODUCTION OR PROFIT?

MANUFACTURING MANAGEMENT is often in a position where it can choose between two roads of action—increase production, or increase profits. The first does not necessarily provide the latter. The difference between these viewpoints was clearly pointed out in a Linear Programming study recently made in the Tube Mill of a large midwest manufacturer.

The study showed that scheduling for maximum profit would increase company profits by close to $350,000 over last year*. On the other side of the ledger, scheduling for maximum output would increase the quantity by 22% but profits would decrease 23% below the maximum profit, or about $300,000 a year! This increase in profit was the direct result of a selection of products, using Linear Programming, and is based on the same production costs in both cases. The analysis considered such factors as plant and machine capacity, sales forecasts by various warehouses, shipping rates by items to the various distribution centers, and present and proposed company policies.

Should you produce A, or should you produce B? Which should you make, and which should you buy?

The answers constitute a new manufacturing concept, which can help you increase company profits. This concept of "opportunity profit"—an application of Linear Programming—opens the door to the next great area of profit potential beyond those of Cost Reduction and Increased Productivity.

—The Editors

The Tube Mill Study

The problem in the Tube Mill consists of an overload on present production capacity. This overload creates a conflict between Standard and Capped sizes of tubing. The result has been a tendency toward purchasing some sizes of Standard and Capped tubing for resale through the company's various warehouses. Purchased items can be bought at a slight discount; but, after handling costs, they are resold at just about breakeven. In other words, there is no profit in purchasing tubing to fill orders. It is merely done as a customer convenience. The company's customers are serviced by nine warehouses scattered across the country. Due to the increase in shipping costs, the farther the warehouse from the factory, the greater is the tendency to purchase tubing from outside sources close to the warehouse.

The method of supplying tubing to the customer as originally proposed was to manufacture everything for the home warehouse. All Capped tubing for the remaining warehouses was to be bought and resold. Any remaining production capacity would then be used to fill orders for Standard tubing for nearby warehouses. All other tubing would be bought and resold. The pattern, here, is clear. The company was following the logical pattern which would reduce shipping costs and therefore increase profits.

*All figures have been changed to retain the confidential nature of the findings. They are, however, representative of the true picture.

At first view, this seems to be a good policy. Actually, it was not until Linear Programming was applied that it could be shown that a far more profitable policy was possible.

To set the problem up for Linear Programming, it was necessary to gather a large amount of data about every machine in the plant and about every product to be produced on the equipment. In some cases, the data was not directly available and had to be developed.

The plant handled several thousand products which represented many variations of approximately a hundred standard sizes of tubing. Each piece of tubing passed through a series of operations such as the piercer, pointers, saws, annealing furnaces, draw benches and straighteners. In many cases, it passed through some operations several times. On the draw benches, for example, some pieces of tubing required as high as 13 separate draws in bringing them down to size.

Basic Principles

Clearly, there are machines and factors that do not play a material role in determining which products should be produced and which should be bought. One of the problems, therefore, in formulating the attack, is to determine which data is essential.

The philosophy that underlies the application of Linear Programming to the Tube Mill problem is based on the concept of a bottleneck. A bottleneck is a condition which limits the total plant output. The bottleneck may be a certain operation or a group of operations or machines. In the case of the Tube Mill, draw benches limit the tube capacity. All other functions of that department, such as sawing and piercing, are limited in their output by the draw benches. Most of these "before-and-after" operations are working six or eight hours a day, while the benches are busy continuously, around the clock. Everything we can get through the benches, we can easily get through the rest of the department. Therefore, the bottleneck determines the ultimate profit that we can make by operating the Mill. See Figure 1.

We can increase the dollar output of the bottleneck in two ways: We can buy new equipment and enlarge the capacity at the point of the bottle neck, or we can increase the earning power of the present equipment.

We can relate profit to time in the bottleneck. Last year approximately 1,400,000 minutes of draw bench productive capacity was used on standard tubing. If the profit from standard tubing was about $1,000,000 last year, the company made $.714 for each minute the draw benches were operating. If we could increase this to $1.00 per minute, the company's profit for the year would be $1,400,000.

What Is Linear Programming?

Linear Programming is a method for solving mathematically a large number of choices of action and selecting the best answer. The problem when using Linear Programming, as with any problem, is in the formulation. Once the problem has been stated in mathematical terms, the solution can be derived in a very straightforward manner. In fact, solving the large systems of equations involved in the procedure is currently being done at regular intervals, in several installations, solely by clerical help. In this manner, the more important company personnel are freed from much of their routine so as to devote more time to problems demanding sound judgment.

Once the problem has been properly set up, there are a number of different ways in which the solution can be derived. The procedure used will depend largely upon the complexity of the problem and the urgency for getting an answer.

The more commonly known procedures are three: the Simplex Method, the Transportation (or Distribution) Method, and "Quick and Dirty" Methods.

The Simplex Method of matrix optimization is used for solving complex problems. This method is the one with most general application, and any Linear Programming problem can be solved by means of it. An illustration of this method will appear later in the text.

The Transportation or Distribution Method offers greater facility and speed in solution but is restricted to problems where the efficiency of the alternate choices is the same. Examples of this type include transportation problems, such as confront the railroads where the objective is to supply railroad cars to various customers at a minimum of shipping cost. It may be cheaper, for example, to supply Youngstown with cars located at Pittsburgh and ship cars into Pittsburgh from New York, than to ship the cars directly from New York to Youngstown. The final shipping pattern is determined by the interplay of the unit car shipping costs and the various terminals and customer requirements.

The use of Linear Programming will enable you to allocate these shipments at a minimum cost. And you can do this because Linear Programming considers all factors relative to the solution as a whole, whereas standard procedures treat each factor as a separate problem. Linear Programming is, in a sense, a method for growing in size. Through its use, you can literally get up on top of the problem and look down on the whole network. In actual practice, the schedule clerk solves the whole problem at once, rather than piecemeal. Another advantage of Linear Programming is that you can prove when you have arrived at the best answer; you know that there is no need to look further.

The number of steps employed are always much fewer than would be required if every possibility were to be evaluated separately. In fact, the number of steps required to obtain the best solution is always finite, even if there is an infinite number of alternate choices!

In the case of scheduling on machinery or equipment, it is frequently necessary to get an answer quickly, such as when breakdowns occur. In these cases, it is usually better to solve the problem by Quick and Dirty Methods. In essence, quick and dirty solutions still employ all of the principles of the other solutions. The formulation of the problem is the same as before. The organization, the data needed, and the patterns of solution are the same as before. The basic difference is that a planned procedure for selective inspection of data is employed, based on the particular peculiarity or special property of the individual situation. This latter point is emphasized because it is not always obvious which types of problems will lend themselves to this or that particular approach. Solutions of this nature will seldom give the best possible answer, but will normally come close enough so as to make the use of high speed computers impractical. It is worth noting that, in those cases where these methods have been employed, the results were far better than had been obtained previously by use of more conventional techniques.

If the solutions must be precise and time is important, then large scale digital computers can be employed. Several of the present computers available for outside use have been programmed for solving Linear Programming problems.

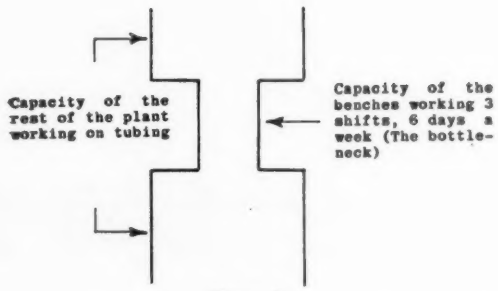


Figure 2.

You will soon see how it is possible to increase the profit-per-minute by means of Linear Programming.

What is true of profit is also true of production. If we wish to increase the quantity through the bottleneck, we must then work in terms of quantity-per-minute. In either case, it is possible to achieve a considerable increase, without any change in equipment. (This statement is not intended to minimize the importance of equipment modernization, methods improvement, etc.—when necessary.)

To increase the profit-per-minute involves the concept of opportunity profit. Opportunity profit is the increase in profit that can be made by running one part instead of another, and is determined by the profit-per-piece divided by the pieces-per-minute. It is seen from this fact, that the piece with the highest unit profit will not necessarily give the highest profit-per-minute.

Let us exaggerate this concept for purposes of illustration. Suppose that one piece of tubing makes a profit of $6.00, with a running time of 10 minutes. The profit-per-minute would be $.60. Another piece of tubing may make a profit of $5.00, with a running time of 8 minutes. In this case the profit-per-minute would be $.625.

In other words, if we could sell all we could make of either product, we would make the greatest profit by making the latter item. That such cases actually exist in Industry is shown by the solution we arrived at in the case of our Tube Mill example (see Table I). It is more profitable to make some items for the West Coast and pay the shipping cost than it is to make others for the home warehouse. The same thing is true for home warehouse items only—namely, some prove to be more profitable than others, without direct regard to the unit price tag attached to each.

Solving the Tube Mill Problem

Working with the basic principles just discussed, the first step, after isolating the bottleneck equipment (draw benches) was to gather the relative data and organize it into a coherent picture.

Gathering the data essentially amounted to getting a list of the benches, utilization figures, available time on each, a list of all the tubing produced in the Mill, a standard operational breakdown for each size, and a list of all the equipment alternates and times for making each single draw. Since time was given in terms of draws, which represented any number of pieces, it was necessary to determine the number of pieces that were involved in each draw. In this way we were able to get the time per piece per draw.

A list of the warehouses, and sales forecasts by warehouses by products, were obtained along with shipping rates and the profit-per-piece at the plant before shipping costs were deducted. Whereas profit is normally based upon total cost variance including shipping charges, what we need is the profit at each specific warehouse.

Shipping rates were given in terms of weight minimums and destination. The rates for a specific destination were then deducted from the factory profit on each product to give the profit at each warehouse.

The next step was to set up the matrix for solving the problem. (A matrix is a mathematical arrangement of the coefficients of algebraic equations). Figure 2 shows a part of the simplex matrix as it appears for one size of tubing and the three warehouses requisitioning that particular product.

The matrix is designed to convert normal profit into opportunity profit, and to compare for profitability of producing various products. We don't know what the opportunity profit is by direct inspection, because we don't know what combinations of machines will be used to make the products. The only approach is to solve all possible combinations of time, profit, and product that are relevant to obtaining the best answer.

The matrix in Figure 2 would normally require solution by electronic computers. It is possible, however, to perform a transformation on the data which will convert the matrix to a method suitable for hand calculation. The transformation is possible because of the type of data involved. The new (distribution) matrix, Figure 3, is much simpler to work with. In some instances, the distribution matrix can be set up directly without actual construction of the simplex matrix.

In constructing the distribution matrix, the vertical columns are arranged in descending order by relative profit. In scheduling the utilization of available capacity to meet forecast requirements, assignments are made on the matrix, working from left to right—giving priority to those product orders having the greatest relative profits. The complete conversion of the simplex matrix required two weeks, at which time the answer was obtained directly by setting up the distribution matrix, without further solution.

The rules for performing these operations are quite simple and can be readily taught to clerical workers.

The peculiarity of the data which made this type of matrix solution possible is the fact that there is a bottleneck within the bottleneck machine group. This bottleneck exists on the last four machine groups. When these machines were loaded, there was still open capacity on the first machines. This meant that we could solve the problem for the smaller bottleneck and then finish using our capacity on the first machines with products that can be made on them alone.

Caution must be exercised in working with bottlenecks of this sort since there is a tendency for the bottleneck to shift as the mix changes. In this case, were the mix to change over a period of time to where the first machines became the bottleneck, then the present solution would no longer be valid. However, since this solution is for a year in advance, it would normally be safe to assume that a regular pattern of sales would not affect it. In the case of other plants that have been analysed, bottlenecks of this type have shifted from week to week.

Different Solutions

In arriving at the solutions, we approached the problem from the standpoint of the forecasted sales and also from the standpoint of both increased capacity and expanded sales forecasts. We will not go into how these variations were handled other than to emphasize the generality of the final answers.

In arriving at the solution of what products to make and which to buy, we ended up with a priority of products. This priority lists the most profitable products first and the least profitable last. A part of this table is given in Table 1. It will be noted that warehouse No. 3 items are included right down the line with home warehouse items, despite the difference in shipping costs. It will also be noted that the profits-per-piece are not directly aligned with the profitability as indicated by the priority.

Because of the general approach that was used, the answers obtained cover a wide range of variation in sales and capacity. The solution is true for the present capacity as well as the expanded, and has the additional virtue of considering the course of action to pursue as sales increase. Since the answer is given in terms of priority of one product over another,

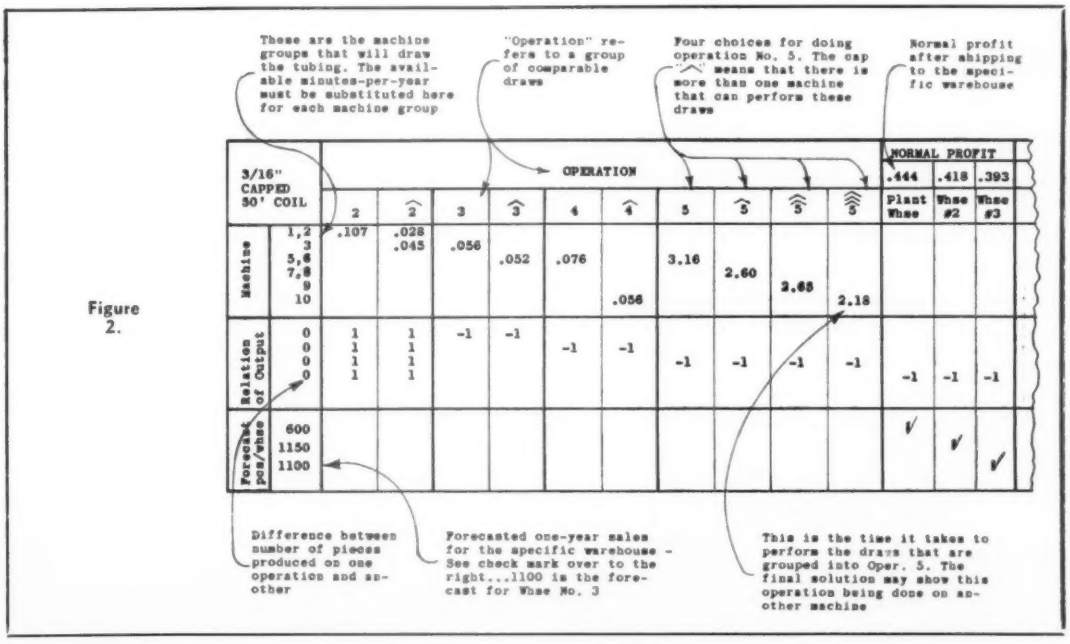

These are the machine groups that will draw the tubing. The available minutes-per-year must be substituted here for each machine group
"Operation" refers to a group of comparable draws
Four choices for doing operation No. 5. The cap "^" means that there is more than one machine that can perform these draws
Normal profit after shipping to the specific warehouse
3/16" CAPPED 30' COIL
OPERATION
NORMAL PROFIT
.444 .418 .393
Plant Whse
Whse #2
Whse #3
Machine
Relation of Output
Forecast pcs/whse
1,2 3 5,6 7,8 9 10
.107 .028 .045 .056 .052 .076 .056 3.16 2.60 2.68 2.18
0 0 0 0
1 1 1 1
1 1 1 1
-1 -1 -1 -1 -1 -1 -1 -1
600 1150 1100
Difference between number of pieces produced on one operation and another
Forecasted one-year sales for the specific warehouse - See check mark over to the right...1100 is the forecast for Whse No. 3
This is the time it takes to perform the draws that are grouped into Oper. 5. The final solution may show this operation being done on another machine

Figure 2.

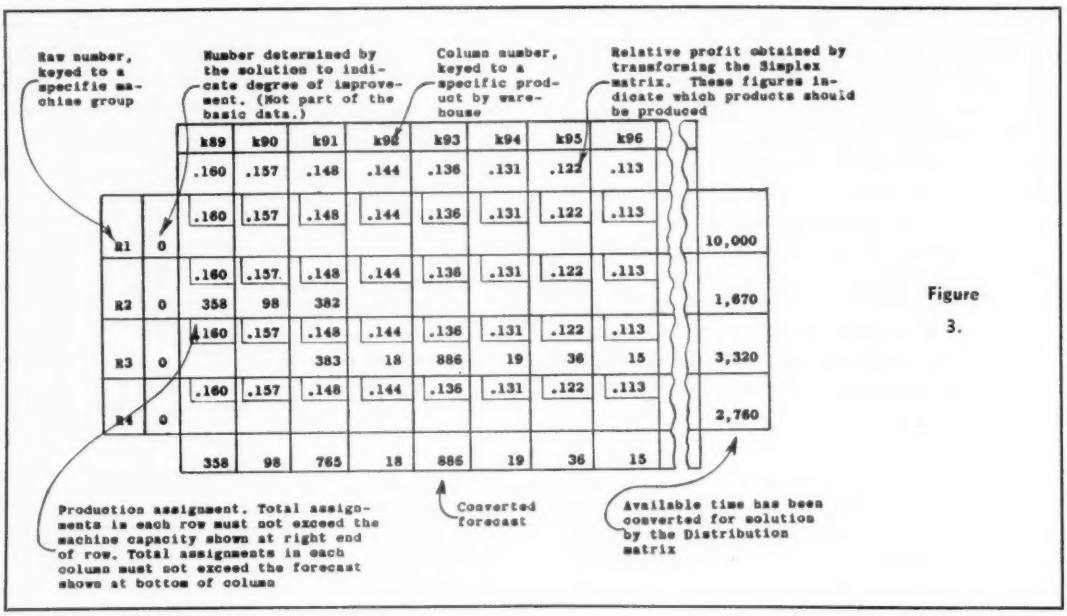

Raw number, keyed to a specific machine group
Number determined by the solution to indicate degree of improvement. (Not part of the basic data.)
Column number, keyed to a specific product by warehouse
Relative profit obtained by transforming the Simplex matrix. These figures indicate which products should be produced
k89 k90 k91 k92 k93 k94 k95 k96
.160 .157 .148 .144 .136 .131 .122 .113
R1 0 10,000
R2 0 358 98 382 1,670
R3 0 383 18 886 19 36 15 3,320
R4 0 2,760
358 98 765 18 886 19 36 15
Production assignment. Total assignments in each row must not exceed the machine capacity shown at right end of row. Total assignments in each column must not exceed the forecast shown at bottom of column
Converted forecast
Available time has been converted for solution by the Distribution matrix

Figure 3.

quantity and capacity determine only how many of the products on the bottom of the list are to be purchased. In other words, on the basis of the load ahead of the equipment, the overload is purchased from outside sources in order of lowest priority.

TABLE I. HIGHEST-PROFIT PRIORITIES

Product*	Location (Whse)	Priority	Profit/Pc. /Whse
1-1/4B3	2	10	4.50
1-1/4B	1	11	2.03
1-1/4A3	1	12	4.48
1-1/2A	2	13	2.23
1-1/2B	2	14	2.20
1-1/4B	2	15	1.85
1-1/4A	1	16	1.89
1A3	1	17	3.99
1-1/4B3	3	18	3.94

*A partial list of all the products, arranged in order of the priority applicable when objective is to use present capacity for making highest profit.

TABLE II. HIGHEST PRODUCTION PRIORITIES

Product*	Priority†
1-1/4B	4
1-1/4A	5
3/4B	6
1C	7
3/8A	8
1/2B	9
3/4A	10

*A partial list of all the products, arranged in order of the priority applicable when objective is to increase output.

†No distinction made as to location, since profitability is not considered.

Price changes affecting profit on one single item will require special analysis of that one product, which will probably be shifted in the priority table. Cost changes affecting all products equally, such as increases in pay scale, generally will not affect the status of the priority table.

Several different solutions were made for comparative purposes. These solutions were given in terms of a list of products, such as the ones shown in Table I, and II. Products were listed by priority and showed what should be produced to accomplish a certain objective. In all cases for comparative purposes, the same capacity and forecast figures were used.

Similar tables were made up showing comparisons of the highest-possible profits with last year's production (Table III) and with the proposed method of purchasing which was outlined earlier and designed to reduce shipping costs.

. . . *Continued on page 69*

TABLE III. COMPARISON OF RESULTS*

	Table I (Highest-Profit)	Table II (Highest-Production)
Pieces Produced	820,000	1,000,000
Increase in Pieces		180,000
Profit Produced	$1,300,000	$1,000,000
Increase in Profit	300,000	

*Based upon use of same capacity.

Air Power FOR METALWORKING . . . III

PORTABLE PNEUMATIC TOOLS REDUCE PRODUCTION COSTS

by Carl F. Benner, Associate Editor

THE widespread use of pneumatic tools is due primarily to the high power they develop per pound of weight. Light weight, compactness and flexibility enable pneumatic tools to out-perform portable hand tools of other types.

Pneumatic tools of the rotating type, such as grinders and drills, remove metal rapidly because of sustained speed under load. The high power capacity of the tool provides ample energy to maintain speed under load while the free speed is controlled through the use of a governor or other device. When the tool is put to work, the load starts to reduce the speed and the tool is then supplied with additional air to keep cutting action at a high rate.

The advantages of air-operated tools become even more pronounced under present conditions, since labor and overhead costs have risen steadily, while the cost of air power has remained the same and in many cases has been reduced. A careful analysis of the cost of air to operate pneumatic devices will show that it is less than generally supposed, and that this cost is surprisingly low compared with the cost of the operator and the cost of providing the necessary facilities for the operator.

Obtaining Maximum Efficiency

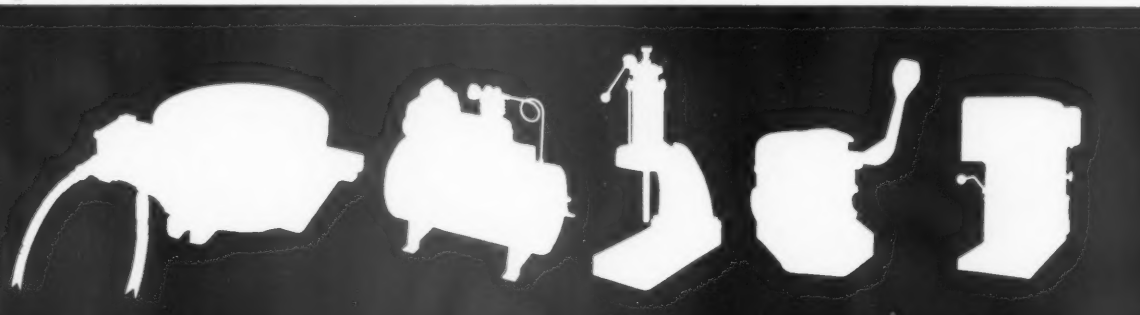
The importance of obtaining maximum output from tools of all kinds cannot be over-emphasized. This is true because labor is by far the largest item in the total cost of manufactured products. Any reduction in the efficiency of the tools will therefore materially increase the unit cost of production.

Maximum output of pneumatic tools requires an ample supply of air at the proper pressure at the tool itself so that the tool can develop full power.

A hypodermic needle attached to an air gauge, as shown in Figure 1, will show the air pressure actually available at the tool. It must be emphasized that the pressure shown at the compressor does not indicate the pressure delivered at the tool itself while the tool is running. Such a test may indicate that only 60 pounds pressure is available at the tool, instead of 90 pounds and, if the condition is remedied, production will be increased from 25 to 50 per cent, provided the tools are in good condition and can deliver the increased power provided by the increased pressure.

If it is found that pressure is inadequate, the first step is to check the size of main line pipes, down pipes, valves and fittings, and air hose.

This article has been adapted from text of the "Compressed Air Handbook" through the courtesy of The Compressed Air and Gas Institute. The Institute also supplied all photos for this article. The cooperation of the Institute in making this Air Power series possible is hereby gratefully acknowledged.



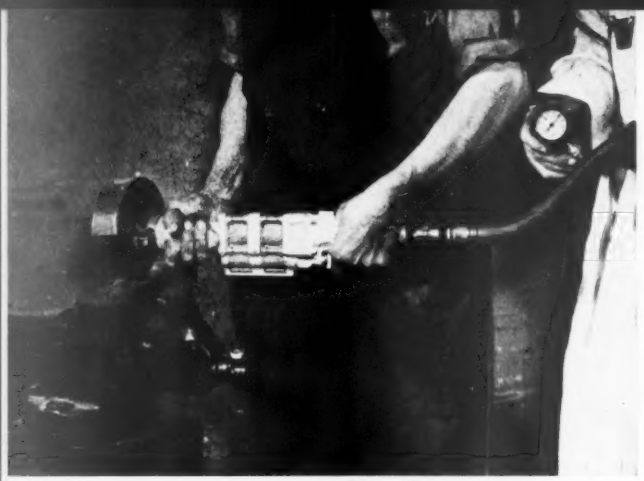


Figure 1.

Careful consideration must be given also to the size and length of hose to use, for hose can very severely restrict the air pressure delivered to the tool. The size of hose should be as large as practicable and as short as possible.

The importance of obtaining maximum efficiency from pneumatic tools is illustrated by the following figures:

If ten men operate pneumatic tools 8 hours a day, with labor and overhead costing $2 per hour, their time will cost $2 x 10 x 8 = $160 per day.
If their output can be increased only 10%, by improvement in the air supply, the savings on the ten men will be 10% of $160, or $16 per day.

If ten tools consume an average of 30 cubic feet of air per minute under poor conditions, assume that the consumption would rise to as high as 45 c.f.m. in order to develop full power and realize the 10 per cent additional production indicated above. This would mean:

15 more cu. ft. per minute of air x 10 tools = 150 additional cu. ft. per minute at full use. If the tools are in use one-half the time, the actual extra air required is—150 cu. ft. x 50% or 75 cu. ft. per minute.

This additional air would cost as follows:

75 cu. ft. per minute x 60 min. = 4500 cu. ft. per hour
At a cost of 7c per 1000 cu. ft. = 31½c per hour
Or, for a day of 8 hours, $2.52. This contrasts with savings of $16.00 per day.

If proper air supply from the compressor is already available, the cost of realizing this substantial saving is limited to the cost of correcting the distribution system and the hose. The valves should be checked, nipples in the end of tools should be eliminated, proper hose provided, etc.

Various Types of Pneumatic Tools

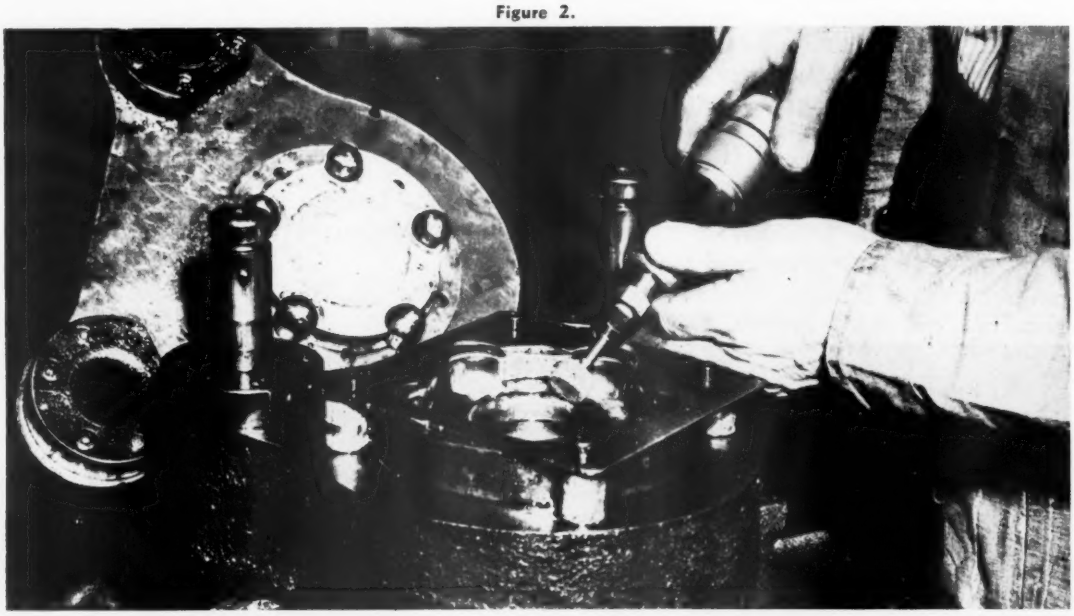
The wide range of pneumatic tools available in different fields suggests careful selection so that maximum output may be obtained with minimum effort by the operator. Air-operated tools fall into the following main classifications:

Abrasive tools—grinders
buffers, sanders, etc.
Drills, reamers, tappers, stud setters.
Screw drivers, nut setters, wrenches and impact tools.
Percussion tools—chipping hammers, riveters, scaling hammers, etc.
Compression and yoke riveters.

Abrasive Tools

Pneumatic tool manufacturers have developed tools with a wide range of power and speeds for many different applications (Figures 2 and 3). They also modify standard types to meet special conditions, even though the field for these semi-standard types may be small. For example, cone grinders are available not only in regular lengths but also in 13-inch and 26-inch extensions where the work requires this added "reach." The user should consult

Figure 2.



the manufacturer about his special problems, to take advantage of features available.

For fast metal removal, rubber bonded wheels are usually most effective, using the lightest tool required to maintain full speed under load. While straight grinders are suitable for the majority of the work done, some applications may be handled better with the vertical type of tool or with cone grinders or extension grinders.

The air consumption of pneumatic grinders varies with the size of the tool and the nature of the work. A modern heavy-duty 6-inch grinder consumes 20 cubic feet of free air per minute while idling and between 20 and 50 c.f.m. under load, the latter representing occasional extreme cases, such as operating a grinding wheel in a corner where the area of contact is high. The actual air consumption, under average load conditions, is usually less than 35 cubic feet per minute.

Actually, tools are used only a part of the day since other operations, such as shifting the work, etc., leave the tool out of operation. In the case of the 6-inch grinder mentioned, the factor of use may vary from 20 to 60 per cent, with perhaps 50 per cent as a high figure for computing air costs. Therefore, the actual cost of air for operating the 6-inch grinder may be figured as follows:

35 cu. ft. per minute air consumption times factor of use of 50%, or air consumption of 18 cu. ft. per minute.
This equals 1080 cu. ft. per hour, which, at an overall cost of 7 cents per thousand cu. ft., results in a cost of 7.6 cents per hour to operate a modern heavy duty 6-inch air grinder.

The accessories to use with a tool must be selected as carefully as the tool itself. Tool manufacturers can readily supply the necessary information for many kinds of work but for special applications only experimentation will reveal the one best accessory and machine to use and, once determined, increased production and easy operation continue automatically.

For rapid grinding, maintenance of high rotative speed under load is essential. Handheld portable pneumatic grinders uniquely meet this condition because they develop the high power required with a minimum of weight.

The free speed of modern air tools is usually limited by an automatic governor, set to permit the maximum allowable peripheral speeds for various types of grinding as defined in "Use, Care and Protection of Abrasive Wheels," American Standards Association, approved September 1, 1943.

Figure 3.

Drills, Reamers, Tappers and Nut Setters

Modern pneumatic drills are commonly powered by a vane type rotary air motor. A governor or other device controls the free speed, thus preventing racing of the drill point but delivering additional air to the motor as the load is applied, thereby maintaining the necessary high speed. Today's air drills range from 1 1/4 pound types delivering 1/4-horsepower at 10,000 rpm to drills weighing 175 pounds, delivering 6 horsepower at 20 rpm.

In designing pneumatic drills special attention is given to safety. Self-closing safety handles are available which stop the drill when the handle is released. Variable speed may be obtained by gradually opening the throttle valve, making it possible to start a difficult operation with controlled speed and power. Pneumatic drills are explosion-proof, an important consideration where there is any danger of combustion. They will not heat under

Figure 4.

the most severe service and will not cause radio interference. Rotation can be reversed instantly by twisting the throttle without the slightest damage to the mechanism.

A great number of accessories are available for use with pneumatic drills and reamers, including such items as right angle attachments, tapping or stud setting attachments, etc., each of value in reducing operation time and speeding up production.

Right angle types of pneumatic drills designed especially for use in close quarters and commonly known as corner drills, are available in capacities of 1/2-inch to 2-inch and also for extra heavy work. These drills are designed for use in extremely close places where the ordinary drill cannot be operated. Corner drills will drill, ream and tap, and will do all the work commonly done by the conventional types of pneumatic drills.

The air consumption, controlled by the governor or other means, is low. The cost of air for operating a heavy-duty drill may be computed as follows:

7/8-inch capacity drill uses approximately 20 to 50 cubic feet of free air per minute at 90 pounds pressure or an average of 35. Assuming a load factor of 25 per cent—a conservative estimate—gives an air consumption of 8.75 cubic feet per minutes or 525 cubic feet per hour.

With an overall cost of 7c per 1000 cubic feet, the cost of operating a 7/8-inch heavy-duty drill is approximately 3½c per hour.

Small Types of Air Drills

In recent years completely new lines of pneumatic drills have been developed, weighing in general from 1 1/4 to 3 1/2 pounds. They are easily handled without undue operator fatigue. These tools are available with pistol grip handles or with designs wherein the motor housing serves as a handle. These small drills are also available with 30, 45, or 90 degree fixed angle heads and 360 degree adjustable angle heads. The straight type handle is usually preferred on angle head tools. With these tools, holes may be drilled within 5/16 inch of the inside of a right angle and within an opening only 1 inch in height.

Smaller types of air drills (Figure 4) often transform a great many hand operations into power operations, with resulting increases in output per worker per day. In addition, workers like the light weight and ease of handling of these smaller types of air drills.

SCREW DRIVERS, NUT SETTERS, WRENCHES AND IMPACT WRENCHES

Pneumatic screw drivers and nut setters transform many hand jobs into power jobs because of increase in production, lower operating costs, ease of handling and low maintenance. Thus, for example, the cost of assembly may frequently be cut in half. They offer the added advantage of uniform tension on screws and nuts and, consequently, a reduction in spoilage.

The tools used for small screw driving and nut setting (Figure 5) vary in range of weight from 1 1/4 to 3 pounds and offer a choice of convenient operating handles. Power cost is low. Small tools consume an average of less than 10 cubic feet of air per minute with a factor of use approximately 66 per cent. This is a cost per hour for air of about 2.8 cents.

Adjustable clutches are usually employed and can be set for any desired degree of tightness of the screws and nuts, giving accurate control of the operation and making possible the use of relatively inexperienced operators.

Selection of the correct screw driver or nut setter for the individual job is highly important, because of the widely variable conditions encountered. Size and type of screws, including its length as well as its diameter, must be considered, together with other features of its design including type of material. To meet these variable conditions manufacturers have provided a wide range of sizes of air motors combined with a variety of clutches such as the single slip, the double slip, the kick-out or adjustable type and "positive clutches." The solution of any particular problem can best be found in consultation with factory-trained service representatives.

. . . Continued on page 67

SPECIAL TOOLING - Captive or Contract?

. . . is a question that is destined to be with us as long as there are captive toolrooms and contract tool and die shops. It is a question that — with the upswings and downswings, particularly the downswings, in tooling design and procurement — is repeatedly tossed in the lap of manufacturing management. Obviously, the high skills, the diversified and hard-earned know-how and facilities of the country's contract tool and die shops cannot be "moth-balled", only to be reactivated in times of accelerated peacetime productivity or military emergency.

Also, during the downswings, a manufacturing enterprise is subject to understandable internal pressures to sustain more than a mere skeleton of its own toolmaking department albeit that department's original functions may have been strictly those of tool maintenance and repair.

The editors of TOOLING & PRODUCTION feel that the many ramifications of this question were most ably presented by two eminent authorities before a recent meeting of the Southern California Tool & Die Association with leading West Coast manufacturers.

At the conclusion of the meeting, Wayne Ewing, the Southern California Tool & Die Association's chairman of the meeting presented the following in summation of the meat of the discussions:

"We must agree that one of a manufacturer's hidden assets is his list of specialized vendors who have the men, equipment, know-how and flexibility to design and build tooling and machinery to meet a crisis.

"There are figures to prove that three jobbing shops in competition will out-perform a captive shop by a considerable margin, both for delivery and cost.

Wayne Ewing
Meeting Chairman
Southern California
Tool & Die Association

M. C. Alx
President
Southern California
Tool & Die Association

Bruce A. Willsey
Manufacturing Manager
Solar Aircraft Company

Herbert C. Murrer
President
National Tool & Die
Manufacturers Association

"In order that at least a nucleus might be available in time of extreme need, may we urge you manufacturers to adopt the following policy.

"Determine generally the percentage of increase or decrease in your sales volume to your customers and allow your outside production and tool procurement departments to buy according to this same percentage.

"By this means you will assist and encourage the tooling industry to continue in this business, ever ready, willing and able to tackle your problem when you need it most."

What Is the Significance of the Contract Tool and Die Shop in Industry?

by Herbert C. Murrer
MURRER TOOL CO., INC.
Cincinnati, Ohio
President
National Tool & Die Manufacturers Association

FIRST, I would like to summarize the reasons why the contract tool and die industry has grown to the stature where it is considered the keystone of America mass production.

1. The contract tool and die shop is always ready, upon demand by industry, to engineer new tooling, alter and rebuild special tooling and machinery, and fabricate various materials.

2. Its experience with a great variety of operations and materials often enables the contract tool and die shop to solve industry's production problems without the usual long delay for research and experimentation. This helps to get production rolling much sooner than would otherwise be possible.

3. Since everyone working in a contract shop is always "keyed up" for special work and lives, eats and sleeps in this special enviroment, it is possible for the contract shop to accomplish a lot in a short time at a reasonable cost.

4. Quite frequently, industry gets "into the woods" with such deep problems that its perspective becomes cloudy because of the sameness of the problems. On the other hand, since the contract tool and die shop is always solving different types of

. . . Continued on page 64

Air Power FOR METALWORKING . . . IV

AIR CYLINDERS and their Selection for Tooling Applications

by William E. Hoffman, Consulting Engineer, Mentor, Ohio

THE SELECTION of the proper air cylinder and its application can reduce the number of manual operations and increase productivity per machine. The necessity for skilled operators is often eliminated, which in some instances may clear the way for addition of a second shift. Another benefit is the increase in production due to the decrease of worker fatigue.

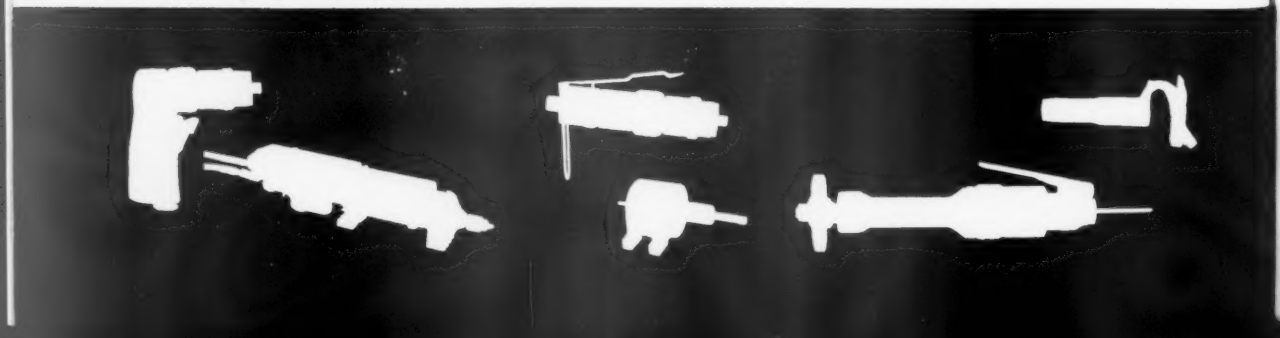
Aid cylinders were fathered by such men as James Watt, who used an air cylinder for his steam engine. They are not new, but with varied control and with proper selection from the wide variety offered Industry, one can find endless possibilities for their usefulness (Fig. 1). They can be slowed to a crawl or made to operate at very high speeds. The piston can move with a gentle stroke or with the force sufficient to pierce steel plate. Their force can replace cams, eccentrics, cranks, links, lever, wedges, screw action, etc.; and, serious consideration should be given their use in all mechanisms where there is to be a transmission of power, or where a thrust is involved.

Although there are a great number of manufacturers of air cylinders, often called air motors or pneumatic cylinders, their selection is not difficult. They come in a wide range of sizes, shapes, mountings, special attachments, and constructions. However, the engineer will find they fall into a simple pattern which—when understood—can make the use of air cylinders routine.

Before an air cylinder can be selected, the engineer must first establish the amount of work that is to be expected of the cylinder, the stroke necessary to accomplish his work, and other pertinent data.

What Size Cylinder?

First of all, the pressure required to do the work is usually an approximation, at least to start with, and may never be known exactly. The exact pressure in most instances is unimportant, provided we use a safety factor to be sure enough force is available. Friction will run around 5% in a new system having the proper amount of lubrication carried to the piston and cylinder walls. The air first passes through a lubricator unit, installed in the supply line specifically for this purpose. This 5% loss is only in the cylinder itself. There may be as high as 35% lost in the ways, slides, or bearing that carry the force to the work.



Mechanical loss or gain should be figured separately. A good rule is to multiply the estimated or actual force required for the job by 1½. If, in extreme cases, there is still reason for doubt, increase the estimate 2 times. This may seem extravagant but, if space and budget allow, the larger and more expensive cylinder may be worth it. This would be especially so if the application had to do with an experimental job.

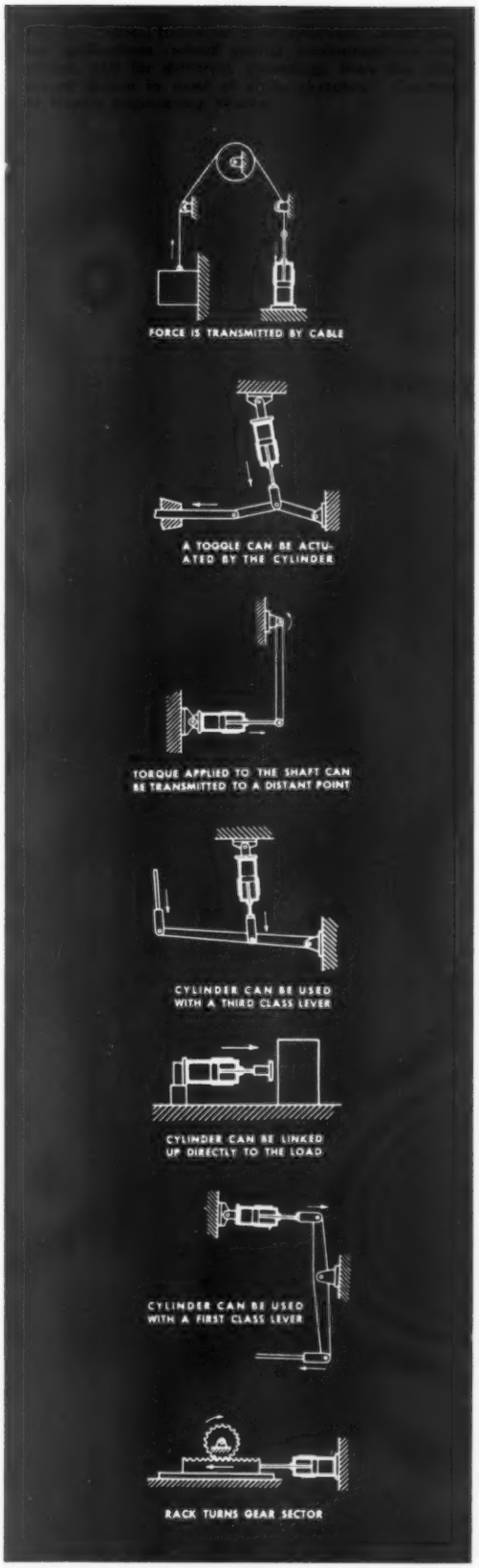
As the diameter of the cylinder increases, the velocity of the piston decreases, but not appreciably so up to 8" diameter. If velocity of the piston rod is an important consideration and it is necessary to use a larger more powerful cylinder, the ports can be opened up to provide greater piston velocity. In instances where line pressures are over 120 psi, and high piston velocities are required, cylinders with double porting should be used. These double-port cylinders can also be used on lower pressure lines, in which case one port is usually closed off.

Assume, for example, the operation under consideration was that of punching a hole in a plate. Determine the section modulus of the plate, and apply it in a shear formula from which the required force can be calculated. Be sure to use the proper constant for the material involved. A more simple example might be where the air cylinder is applied for lifting, in which the volume of the material to be lifted would be multiplied by its weight per unit. In the next issue of T & P, the article on air cylinders will give more specific and detailed examples of their application.

Of great importance is the air pressure carried in the line to the cylinder. It is what activates the cylinder and must be known before the diameter of the cylinder can be picked. Pressures at the cylinder will vary, depending on the demands of the plant; however, most installations are calculated on a probable pressure of 90 psi.

Let's take a hypothetical case where the actual force required at the work is estimated or figured to be 266 lbs. To be safe, we multiply this by 1½ and arrive at approximately 400 lbs. In using this figure to run through the linkage, from the work back to the piston rod, we find it necessary to have 500 lbs pressure at the rod to come out with 400 lbs force at the work.

Since air cylinders are classified and catalogued by their diameters, the question then is what diameter air cylinder will be required if you have a line pressure of 80 psi. Normally we would use 90 psi as was mentioned


FORCE IS TRANSMITTED BY CABLE
A TOGGLE CAN BE ACTUATED BY THE CYLINDER
TORQUE APPLIED TO THE SHAFT CAN BE TRANSMITTED TO A DISTANT POINT
CYLINDER CAN BE USED WITH A THIRD CLASS LEVER
CYLINDER CAN BE LINKED UP DIRECTLY TO THE LOAD
CYLINDER CAN BE USED WITH A FIRST CLASS LEVER
RACK TURNS GEAR SECTOR

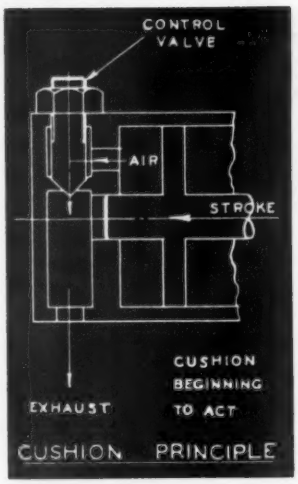


Fig. 2. The cushion principle as employed at the nowworking end of a cylinder on a pullstroke application.

before, but in this case we find the demands on the air line are great and there is a tendency for line drop.

To get the effective cross-sectional area of the cylinder we want, take 500 lbs and divide it by 80 which gives us 6.25 sq. in. The 6.25 is then substituted in the formula below, in place of A (area). Then solve formula for r (radius), which can be multiplied by 2 to give the required diameter of 2.82″.

$$\frac{500 \text{ psi}}{80 \text{ psi}} = 6.25 \text{ sq. in.}$$

$$A = \pi r^2$$

$$6.25 = 3.1416r^2$$

$$\frac{6.25}{3.1416} = r^2$$

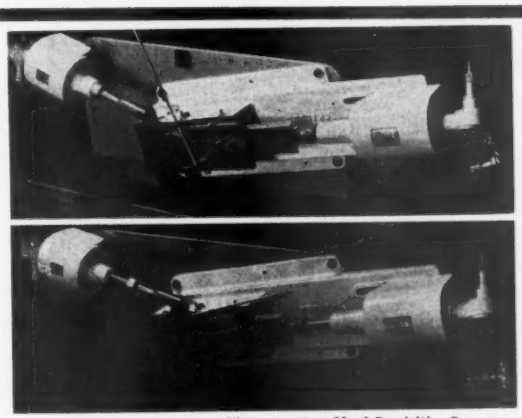
$$1.99 = r^2$$

$$\sqrt{1.99} = r$$

$$1.41 = r$$

$$D = 2r$$

$$D = 2.82 \text{ in.}$$



Photos courtesy Mead Specialties Company.

AIR-POWERED TUBE BENDER

This tube bender is made up of the bending die and two air cylinders, a slide-type Work Feeder, and a quick exhaust valve. The tube to be bent is inserted in the die as shown in top view. As the cylinder-actuated Work Feeder shown at the right advances the die, the tube is bent against a fixed anvil and takes the required shape as shown in bottom view. To complete the bend, the air cylinder at the left actuates a pivoted shoe to roll the bend to completion.

Cylinder diameters usually run in ½″ increments up to the 5″ size. From there on up, they vary usually in 1″ increments. Knowing this, we pick the 3″ diameter for our job.

Notice that in all instances we lean toward the safe side.

The cylinder manufacturers want engineers to have their catalogues. These are your best sources of air cylinder information. If your files or your company's files are lacking in catalogues of this type, the names and addresses of leading air cylinder manufacturers will be found in the advertising pages of TOOLING & PRODUCTION. Many companies have helpful quick setting charts, data sheets, slide-rule type calculators, and other aids which will give a good check on your selection if not make the selection for you.

Other Considerations

The stroke of the cylinder is the next consideration. If the force of the piston is direct to the work with no linkage or mechanisms between, it is a simple matter to determine the stroke. If there is linkage involved, then the mechanics would have to be solved, keeping in mind what is of importance in ordering the cylinder. Some factors in determining the stroke might be—the gap necessary for loading the workpiece between its locators and the clamping mechanism; the amount of travel necessary to move a tool through or across the workpiece, in cases where the air cylinder is being used for a feed movement; etc. On some air cylinder models, the stroke can be adjusted. This is accomplished by the adjusting in or out of a sleeve that protrudes into the chamber and acts as a solid stop to the piston.

Speed control may or may not be necessary in the application. Normally, for clamping, it is not necessary. Exceptions exist in cases where the impact might endanger the work, or where multiple clamping of a workpiece is required and it is desirable to clamp at several points but not instantaneously. In this case, lag can be achieved where necessary by individual speed control. Speed control also is a must in instances where the air cylinder or air-and-oil cylinder unit is being used as a feed device.

Speed control is obtained in two ways—by regulators mounted in the air line, or by the use of cylinders with built-in speed control when the need can be anticipated. Normal speeds are from 20 fpm for a 20″ dia. to 200 fpm for a 4″ dia.—these at 80 psi line pressure. If speeds in excess of these are demand-

ed, the line pressure would have to be increased or double porting employed, or both.

There are two types of pneumatic cylinders—the single-acting and the double-acting.

The single-acting cylinder has air pressure in one direction only, the piston being returned by a spring to its starting position. The internal spring is only strong enough to return the piston and little else. If heavy loads are to be returned in this setup, a strong outer spring would have to be installed at a vantage point; or, if that is impractical, a double-acting cylinder should be used.

The double-acting cylinder is one in which the piston is driven by air pressure in both directions, for the work stroke and the return. In certain applications, the return stroke might also be a work stroke.

Air cushions (Fig. 2) are used to prevent metal-to-metal shock at either end of the cylinder or at both ends. Cushions will help to preserve alignment of component parts of the mechanism or tool, protect the workpiece, and eliminate noise. They are virtually a necessity for high velocity piston speeds and long stroke requirements.

Understanding the air cushion will be the best aid to the designer in deciding if it need be employed and in employing it. In some instances, a fragile workpiece might be clamped by the cushion portion of the piston stroke, with the rapid-traverse portion of the stroke being used only as a timesaver. In other instances, the rapid-traverse portion of the stroke is used to do the work. In all cases, the positioning of the cylinder in relation to the workpiece is important.

Cylinders are purchased with or without cushions, which provide a specified effective cushioned stroke, usually ½″ for cylinders up to and including the 2½″ size. On larger cylinders, the stroke is slowed by the cushion for ¾″. The action of the cushion is controlled by a needle valve. On long stroke, high-velocity action, standard cushions are not effective and special adaptions should be made. See your supplier.

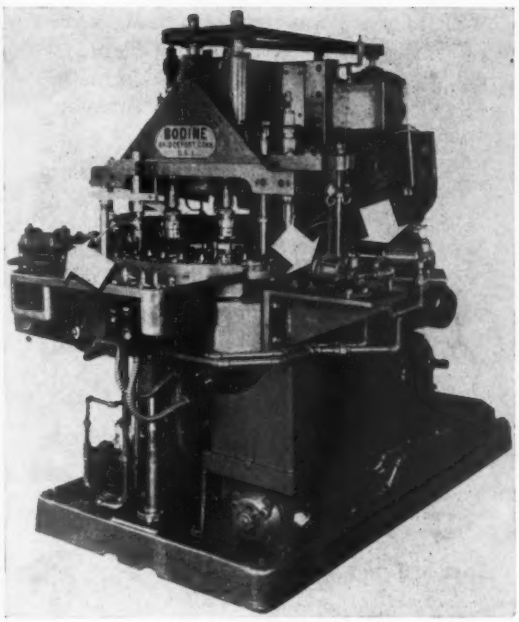


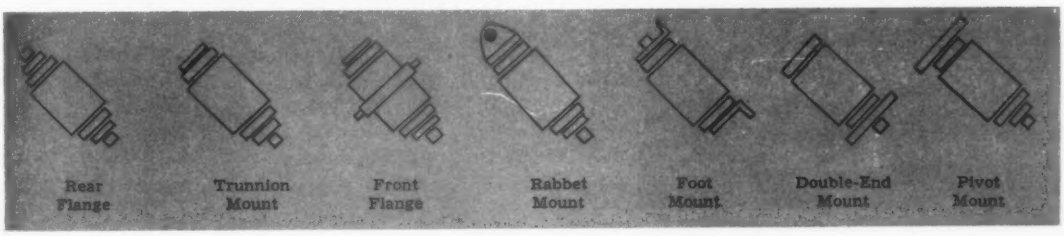
Photo courtesy of Tomkins-Johnson Co.

Clamping Fixtures Operated By Air

A multi-operation drilling and tapping machine, producing 2500 pcs/hr, employs air cylinders to supply the clamping force. This special-purpose, automatic Bodine has a dial-type clamping fixture which is automatically operated by three T-J air cylinders. The fixtures are equipped with interchangeable jaws for a range of hex sizes. The machine is tooled for a series of secondary operations on a variety of tubing fittings.

As to the mounting, there are numerous types—to fit into most any scheme or design. Often it will be found that several different mountings would fit the general arrangement. The designer should be aware of the types offered, so that the choice need not be a difficult one. See schematic drawings of various types of mountings (Fig. 3). Where possible, thought should be given to assembly and to maintenance. Usually, as the design progresses, the type of mounting to use will become obvious. The supporting structure for the cylinder will need to be rigid; and, its design and location

Fig. 3. Some typical types of mountings for air cylinders. Courtesy of Ortman-Miller Co.



will influence the type of mounting required.

Cylinders are generally available with a choice of piston rod ends. Ends may be obtained with male or female threads to be adapted into the design scheme.

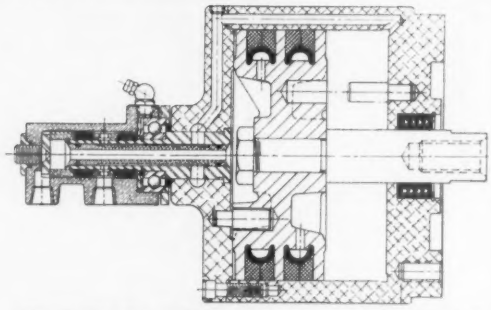


Fig. 4. Rotating cylinders of this type can be mounted on a machine spindle to actuate a chuck by pushing or pulling a rod extending through the spindle. Courtesy of S-P Manufacturing Co.

Special Types

Rotating cylinders (Fig. 4), which are mounted on the outer end of the rotating spindle of a machine serve to push or pull a rod extending through the spindle to actuate a chuck or some clamping device on the other end. They are also selected by their diameters and stroke and have standard adapters for existing machines or can be adapted to special application. Hollow types are available to permit the feeding of bar stock, and are used extensively on lathes and automatic machines.

Where the demand is for simultaneous action of a battery of cylinders, and only a short stroke is involved, the diaphragm types are

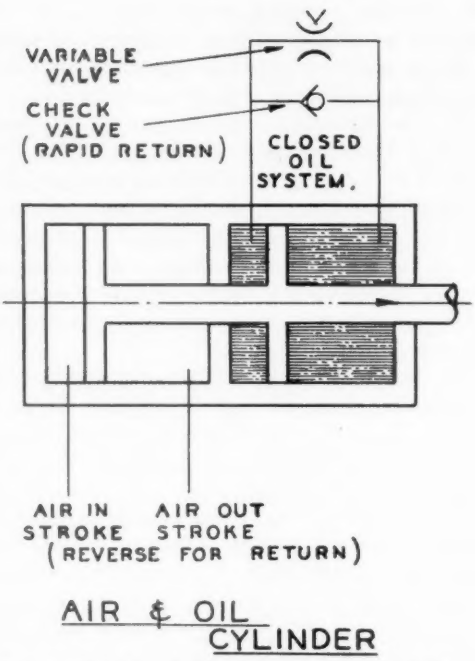


Fig. 5. The air-and-oil cylinder provides for variable control of piston-rod velocity.

excellent. They have practically no friction within themselves; consequently, they will all act at the same time.

On the fringe-area between pneumatic and hydraulic cylinders is the air-and-oil unit, (Fig. 5) also known as the air-hydraulic or airdraulic type. Its principle force is air, with an oil cushion which is metered out at the desired rate for speed control. The choke or

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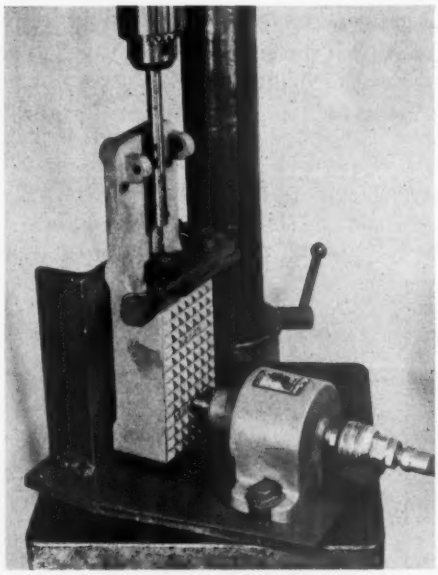


Photo courtesy Mead Specialties Company.

Air Cylinders Simplify Fixture Clamping

Drilling a hole in the vertical offset face of a pedal base casting was facilitated by setting up a simple locating fixture and using an air cylinder to supply the clamping action. The fixture was designed so that the drill jig bushing is mounted in a plate which pivots. This plate is swung out of the way for quick loading and unloading by a spring anchored to the plate and the upright of the fixture as shown.

The clamping cylinder is single acting with a 1" stroke. An internal return spring retracts the ram when the air is exhausted from the cylinder by the control valve.

Three High Production Jobs Tooled for CARBIDES ON AUTOMATICS

THE TREND to automation and fully automatic equipment to get more production per square foot of floor space provides extensive application opportunities for the multiple spindle automatic bar machine.

Obviously, the ultimate in automatic bar machine productivity can only be attained through the most effective use of carbide tooling. To this end, the joint research and engineering efforts of two organizations, Cone Automatic Machine Co., Inc., and Carboloy Department of General Electric Co., indicate that users of automatics can expect a greater return on their capital investment through production increases of as much as 50 to 100%.

The joint development program, a continuing one, has shown considerable progress in its initial four months. It has resulted in the three examples of high production jobs in this report.

Through their studies of these case histories, the two engineering groups found that:

(1) The complexity of multiple tool setups on automatics is no major barrier to the use of cemented carbides;

(2) Tool holders, as well as auxiliary attachments, should be engineered to meet job conditions of automatics;

(3) Proper selection of carbide grades and correct tool geometry are more important in applying carbides to automatics than to other machines;

(4) Adequate horsepower at the work spindles is essential;

(5) A good method of supplying a generous amount of water-based coolant to the cutting areas is a must.

In reviewing the obstacles that had to be overcome before carbides could be successfully used on "Conomatics", Cone and Carboloy agreed on a program that would make use of conditions simulating as near as possible those in the field.

Carboloy's recent introduction of new cemented carbide grades such as the 300 series (grades 350 and 370) especially suited for continued high speed operations, took care of the problem of grade selection.

Cone engineers proved, shortly after the joint engineering program was launched, that their machine was not only designed for carbides, but was a natural for that type of tooling.

They found that machine weight, for example, was important, but not as important as where that weight was distributed to provide rigidity. The Cone machine met the test with only one design change, that of sealing bearings and shafts against water soluble coolants.

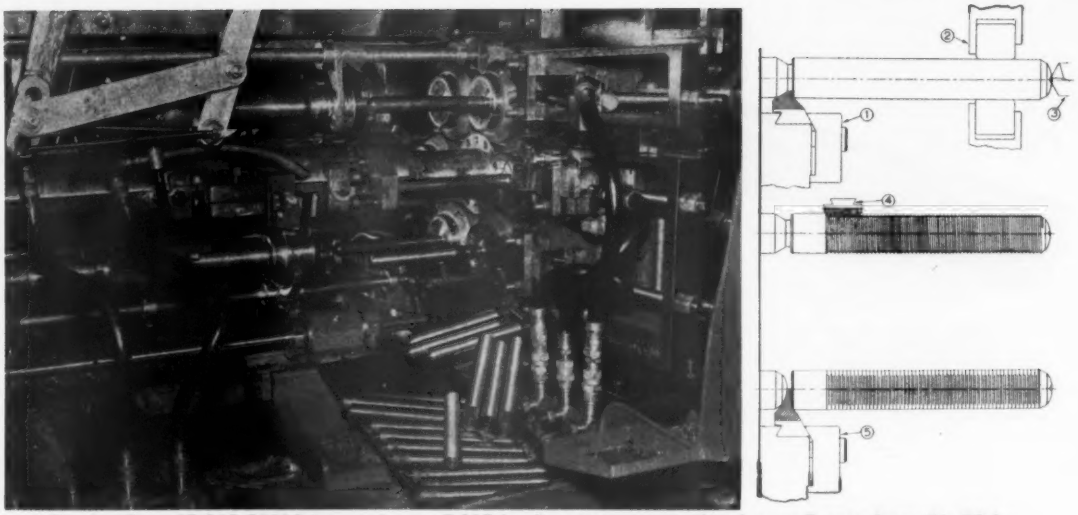


Fig. 1. From 1" SAE B1112 bar stock, two 7 ¾" leveling screws are produced every 7 seconds on this 50 hp, 6-spindle "Conomatic". Cross hatching shows grade 370 carbide tipped tools at three of the six spindle positions: 1, indicates chamfer; 2, three-roll support; 3, spot drill; 4, threading attachment; and 5, form cutoff and feedout. The other three spindles are in exact duplication, hence the simultaneous production of two screws.

The machine also was found to be adaptable to more horsepower, and able to distribute that power through the spindle.

Since the machine itself basically met all the requirements of carbide tooling through inherent design, there was nothing left to do but to become thoroughly carbide minded.

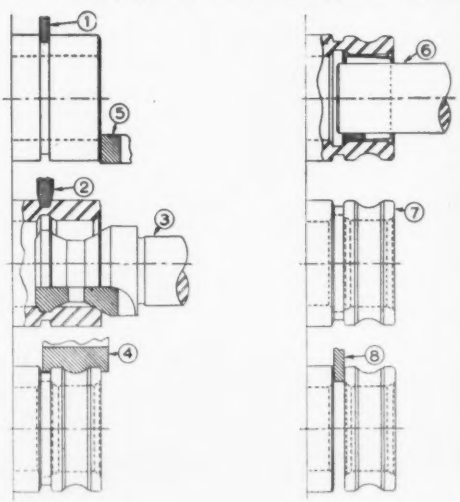
As most multiple spindle setups are individualized, it was agreed to seek for development actual jobs that made use of the commonly known tools, and at the same time jobs that were representative of volume production by the machine. For example, one machine was tooled up to make use of end and side tools that are familiar to all users of automatics. Another was set up to handle 52100 tubing in the production of ball bearing inner races. And a third machine was set up to handle the type of threading that can be accomplished with carbide tipped die head chasers.

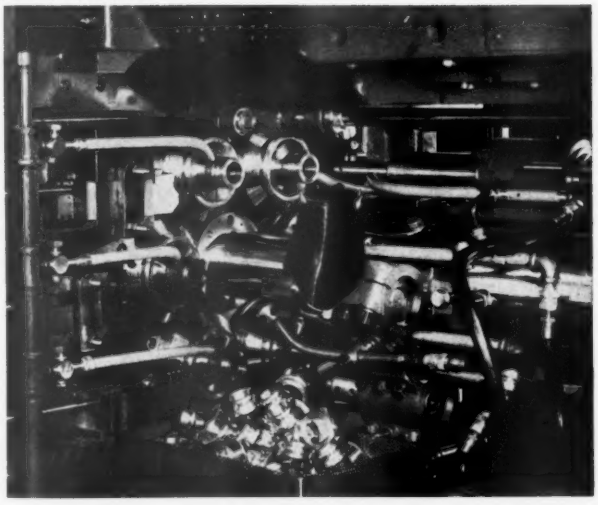
In tackling the threading job, Figure 1, a 7¾" long leveling screw from 1" diameter steel screw stock (SAE B1112) the joint engineering task force tooled a 1⅝" 6-spindle 50 hp automatic with grade 370 carbide.

In production, the machine produced the screws at the rate of two every 7 seconds, or 994 screws per hour. With high speed steel tools, the machine was capable of providing only 140 pieces per hour.

During the operation, the machine generated a direct spindle speed of 958 rpm and a

Fig. 2. This 2 ⅝" 6-spindle automatic bar machine delivers one standard inner bearing race down the chute every 10 seconds. The seven grade 370 carbide tools (half the number previously required on the job) function as follows: 1, breakdown blade; 5, form type butt face; 2, form vertical; 3, internal recess; 4, form; 6, auxiliary spindle, ream; 7, left open for marking face; 8, cutoff.





die spindle speed of 628 rpm thus providing a total effective threading speed of 1586 rpm.

Both chamfer and cutoff carbide tools provided 700 pieces per grind, the threaders producing 1000 pieces per grind. The feeds of both the chamfer and cutoff were 0.005".

Until now, threading was always considered one of the big road blocks for carbides on automatics.

Some of the other interesting aspects of the job are: Only half as many cutting tools as formerly required are used on the job. Also it is unusual to feed out and thread a piece of this length, especially when feeding two pieces simultaneously.

Carboloy and Cone engineers point out in addition that many jobs running on 4-spindle machines, like the leveling screw, can easily be adapted to 6-spindle automatics with a terrific boost in production.

In tooling up a second machine, a 50 hp, 2⅝" 6-spindle automatic, with carbide grade 370, the machine produced standard inner bearing races, Figure 2, at the rate of one every 10 seconds, or six bearings per minute. Previously, with high speed steel tools, the production time reported was about double.

The bearing race, which had an outside diameter of 2¼" and an inside diameter of 1½", was produced from SAE 52100 steel tubing with only seven carbide cutting tools, half as many as required when using high speed cutting tools.

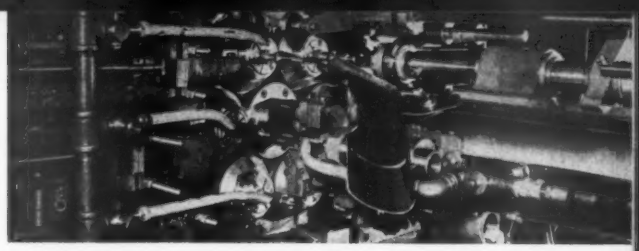
The work, in this case, was run at a speed of 519 rpm or 333 sfpm. Tool life for the operations was: 724 pieces per grind for internal necking, 1270 for butt facing, 1518 for breaking down for cutoff, 1890 for vertical form and breakdown, 810 for forming, 720 for cutoff and 1270 for reaming.

In producing the center portion of an oil shutoff valve, Figure 3, on a third 50 hp automatic, the production rate was boosted with carbides to one every 8 seconds. Formerly, high speed steel tools produced only one center every 45 seconds.

In this case, two subsequent finishing operations, centering and grinding, were completely eliminated through the use of carbides.

Here, the job was engineered to use Carboloy 78B as turning tools and grade 370 for breakdown forming, form taper, finish groove, shave and cutoff.

The work was machined from 1" hex SAE B1112 steel on a 1½" 6-spindle automatic. Tool life was: 700 pieces per grind for double turning, 700 for butt facing, 500 for breakdown form, 450 for form taper, 400 for form grooving, 800 for shaving, 500 for breakdown and



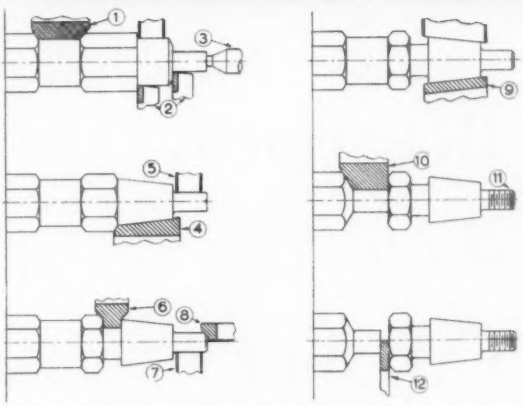


Fig. 3. Producing this valve center on the 50 hp, 1 ½" 6-spindle Cone automatic is an 8-second job. Carboloy tooling, grades 370 and 78B, eliminated two previously required operations, centering and grinding. The tooling at the six spindle positions: 1, form; 2, two-tool roll turner; 3, spot drill; 4, finish form; 5, roll support; 6, finish form groove; 8, butt face, shank type; 7, roll support; 9, shave attachment; 10, radius form; 11, threading attachment; 12, cutoff.

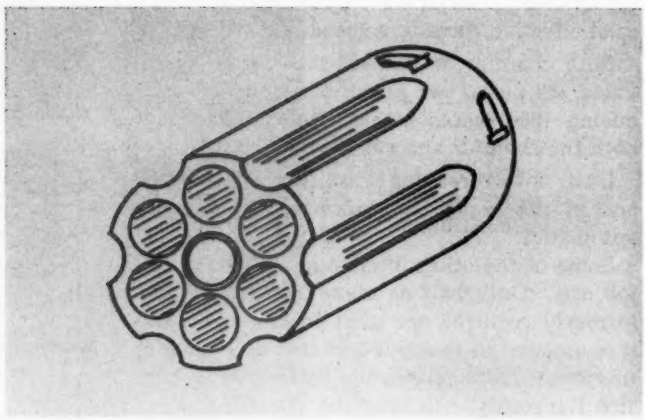
350 for final cutoff. High speed steel was used for spot drilling and for chaser tools since these operations are not critical for the job and can be done while the other operations are in progress.

In all three of the jobs, coolants played an important role. It was found that by sealing off bearing and spindles of the automatics, water soluble coolants did an effective job of cooling both the machine and cutting tools when machine speeds were increased 10 times. The coolant served to remove the heat generated in the machine itself, plus that generated while the cutting tools went to work on the metals.

Effectiveness of the cooling method on the machines was such that Cone engineers were able to decrease bearing clearances of the machines, and to adjust slides and carriers to closer tolerances. The end-effect of all this is reflected in the three jobs described above.

Theoretically, with the same tool material on a job equally adaptable to both multiple and single spindle bar automatic, the multiple should out-volume the single in accordance with the number of work spindles involved.

To maintain so great a production advantage, Cone believes that multiple-spindle bar automatic builders must prepare to provide the user with machines with at least as efficient accommodation for carbide tools as is provided by the single spindle machines.



BURNISHING REVOLVER CYLINDER CHAMBERS BY AIR-POWER

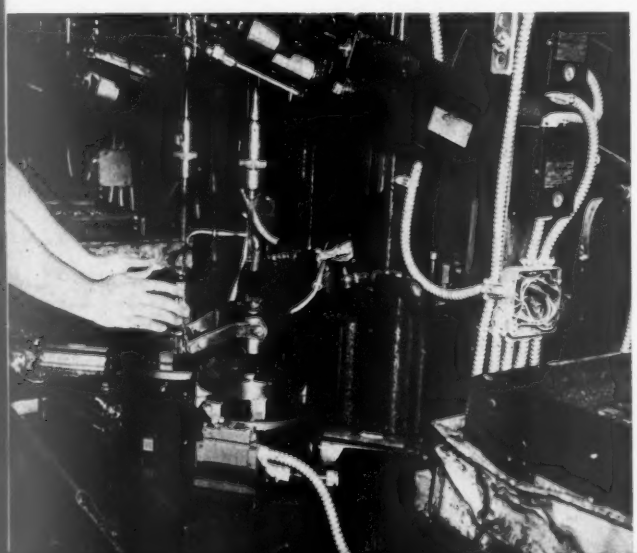
CONVERTING a hand reaming and burnishing operation to Air-Power has paid dividends for Colt's Mfg. Co., of Hartford, Conn.

This change-over in operations was accomplished by equipping two Allen double-spindle drill presses with a Bellows drill press feed and a Bellows six-station rotary feed table for each spindle. A manually operated holding chuck was mounted on each rotary table. Only one two-spindle drill press is shown in the illustration.

The job was to ream and burnish the six chambers of revolver cylinders. The chambers are tapered on a 7° angle from a small diameter of .358″ to the large diameter of .380″. A .001″ tolerance has to be held on the diameter of the hole and .002″ on the depth.

Most of the metal to be removed in developing the tapered hole is cut out by a taper reamer. However, fine feed marks will be left by this operation and these are liable to interrupt the ejection of the shells from the chamber holes. To overcome this, a burnishing reamer smooths the finish down to practically as good as a semi-rough grinding job.

Photos courtesy The Bellows Company



In the operation cycle, the operator loads the cylinder into the work holder mounted on the rotary table, and starts the machine. The drill press feeder advances the taper reamer to the work, makes the cut and retracts. The rotary table then indexes and the reaming cycle is repeated on the second chamber. Thus the machine runs through six reaming operations automatically to complete the entire reaming cycle. The operator unloads, reloads, and starts the reaming machine for the next cycle. He then loads the burnishing machine and starts it, which goes through a similar cycle of burnishing six chambers.

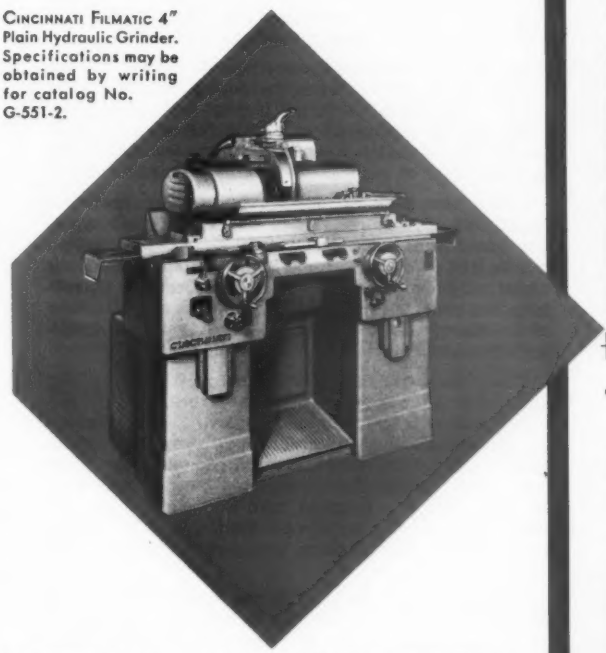
Air pressure on the press feed is only 3 to 5 pounds on the burnishing with a little higher pressure on the reaming. Experience has shown that a fast feeding tool develops a ripping action, while a slow feed gives a smooth finish. At these low air pressures, the feed is slow; and, as more metal is removed, the feed is further slowed up so that the final surface finish is very smooth.

Some of the advantages of the Air-Power operation over the former hand reaming is: increased tool life of about 300%; rejections have been minimized; one operator now maintains production requirements whereas four were required under the former hand method; more accurate parts are now produced since the human element has been replaced; and production volume has been increased.

Precision Grinding Small Parts

at a very low cost

CINCINNATI FILMATIC 4" Plain Hydraulic Grinder. Specifications may be obtained by writing for catalog No. G-551-2.



In general, the cost of machining operations on small parts should be in proportion to the size of the part. Two examples of how this goal is attained with CINCINNATI FILMATIC 4" Plain Hydraulic Grinding Machines are illustrated here. Both are typical setups, one with standard tooling and the other with slight alterations on the machine to attain the highest rate of production at the lowest cost and minimum physical effort. Read how CINCINNATI FILMATIC 4" Plain Hydraulics contribute to these desirable results.

1) FILMATIC grinding wheel spindle bearings require no adjusting or maintenance.
2) You can count on quick sizing within .0001", traverse or infeed.
3) The bed is recessed so operators may be seated, yet all control elements are at their finger tips.
4) Automatic Infeed Attachment controls the complete grinding cycle.

You may obtain more data by writing for literature, or look in Sweet's Machine Tool Catalog for brief specifications.

CINCINNATI GRINDERS INCORPORATED
Subsidiary of The Cincinnati Milling Machine Co.
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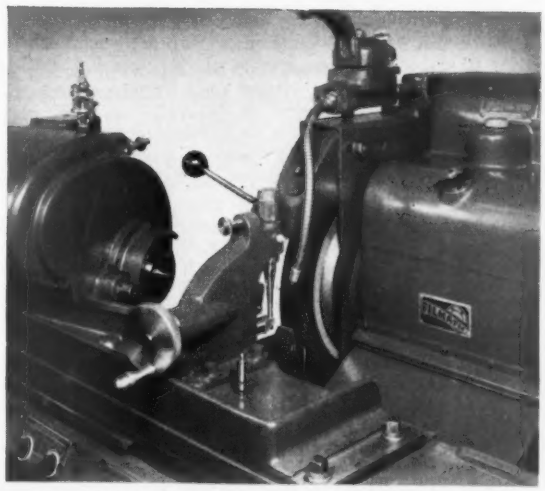
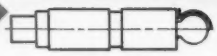
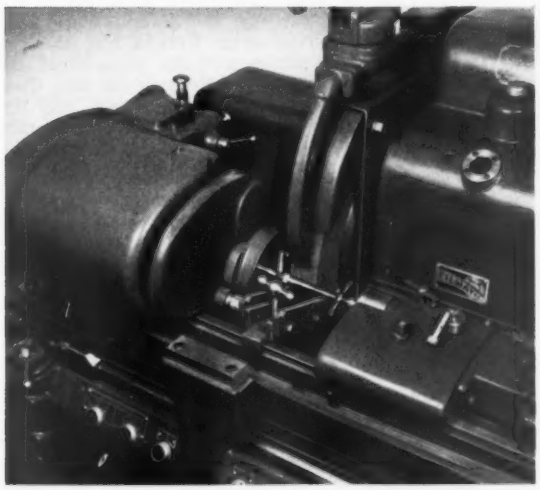




Radius and adjoining face ground simultaneously. This 4" Plain Hydraulic Grinder features a solid table with a short angular section for the headstock, and a combination truing attachment.



Micrometer barrels, 200 per hour, grinding diameter and bevel simultaneously. This 4" Plain Hydraulic is equipped with work cradles, hydraulic footstock, automatic infeed, and special table type profile wheel truing.

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CIRCLE INFORM-A-GRAM KEY NO. 63

Special Tooling, from page 53

problems, it can quickly apply a new idea from, say, an electronic job, to an automotive or an aeronautical product. Needless to say, substantial economy can result.

5. Since the contract shop has this wide variety of services to perform, it can keep its labor force the year 'round. Industry in general, however, may have difficulty keeping its captive tool force busy, and may have to carry them at great cost to keep them available when needed. Of course, this is expensive and unnecessary.

If a careful analysis is made of the burden on these departments and the cost of operation to maintain them for new work, we will find that competitive prices from contract shops will be much lower. There are the added advantages of wide experience, very much quicker delivery, and no huge capital investment in equipment.

The contract tool and die shops have invested approximately half a billion dollars in equipment and facilities. They are prepared to offer some of the finest diversified engineering skill available anywhere in the world. This concentration of high skill and capital in a great number of shops concentrated in the various industrial centers, makes their services available to manufacturers wherever needed. They become industry's toolroom without actually being under its roof.

During the periods of great anxiety when our nation was attacked early in the Second World War and again at the outset of the Korean War, the contract tool and die shops met the tremendous demands for special tooling. Needless to say, these small tool shops, with their low burden and low cost of operation, played a terrific part in winning the war.

These little shops turned from peace to war virtually overnight. Those of you who remember the priorities placed for huge equipment and the lack of priorities to the tool shops for special tooling, also remember the jam. After a dangerous delay, someone in the government finally discovered that the contract tool and die industry was also important and immediately changed this policy, undoubtedly saving many lives.

But why am I calling all of these facts to your attention now? Well, there is again an idea creeping into some of the large industrial plants throughout the country, especially in Southern California, that since the cutbacks in defense and in some civilian programs have compelled them to reduce work forces, they should keep their special tooling in their own toolrooms. The latter had originally been planned for maintenance and repair work only.

Many of these plants had been entirely dependent upon the contract shops since the beginning of the Second World War. Explore any of the recently expanded areas and you find that the contract shops were one of the major factors contributing to this expansion.

It was true in New England, the great Central Eastern section, the Middle West, and now Southern California. It was the existence and rapid expansion of the contract tool shops which made it possible for Southern California's industries to grow beyond our wildest imagination these past 15 years.

Of course, a true cost analysis would show that it costs much more to utilize these departments for tooling than to put it out on contract bids. There is no question that captive shop tooling will take much longer because these plants cannot possibly maintain as large a tool force as the combined contract tool industry in their area.

There is also the problem of the toolroom department head or tool supervisor who may be trying to increase his force in order to make a more important job for himself, despite the excessive cost to his company. This cost frequently can be hidden. It is especially easy to hide when maintenance and new work are in the same department.

In that type of setup, it is a simple matter to load excessive new-tool hours on repair orders. Certainly, toolrooms in large plants are needed for maintenance and repair, but it is cheaper to have new work made by a contract shop—and the same is often true of replacements and repairs.

Just a few weeks ago, President Eisenhower and his Chiefs of Staff concluded that we can not, without great risk to our country, match our limited number of foot soldiers against the tens of millions of infantry waiting behind the Iron Curtain. Therefore, we must anticipate and concentrate on a war of machinery and instruments. That is where America's retaliatory strength must come from.

What does this mean? It means that, with our chemistry and physics, nuclear forces, atomic energy and electronics, all requiring complicated equipment of very high accuracy, we will create nightmares of inconceivable dimensions. You will recall the Armed Forces' insistence upon higher I. Q.-rated recruits because war and defense equipment is becoming so complicated. It will require much more special tooling than ever before to build this equipment.

I need not ask you men in the guided missile and aircraft industries what headaches are confronting you. I need not ask you men in radar and electronics what accuracy means. Why . . . not so long ago, we couldn't even pronounce "johnny blocks" let alone use them. Now we carry them around in our pockets so we can check the inspector! Well, the contract tool and die shop has been an important factor in achieving higher degrees of accuracy. Its skill will be needed much more in the immediate future.

But let one of our great plants in the aircraft industry make a few observations. Pratt & Whitney Aircraft not long ago, in an advertisement, featured the fact that 20,000 special tools were required for the production of the J-57 Turbo-Wasp engine—twice as many as for the R-2800, one of the most powerful piston engines of World War II.

Do you understand now what I mean? Of course, you do. If much of this work remains in the captive toolrooms at this time instead of being placed with the contract shops, many of us will have to find other fields of business. Most of us will survive; we are an ingenious group of men, if I say so myself. But then again, a good many of us will go out of the contract tool business entirely.

We are told that this practice is only an expediency, but I ask you: Are we facing reality, let alone considering the excessive cost? Is this wise, when so recently we had just enough time? Can we afford to allow the bulwark for defending our honor and our freedom—in fact, our civilization—to fall by the wayside because we are again shortsighted?

Next time, we may not have enough time. In the lifetime of all of us gathered here, we twice have seen our country slowly rise to its full might in time to prevent disaster.

In 1917, we needed, and fortunately had, plenty of lead time to raise and equip an army and build the ships on which we could send it to France.

In 1941, we received a telling blow at Pearl Harbor. If Germany had been able to attack us simultaneously, we might have gone down for the full count. But again we had sufficient time to build our broomstick-equipped, undermanned army into the greatest military force in history.

In this age of supersonic planes, guided missiles and hydrogen bombs, we dare not count on any lead time. The men in the Kremlin are well aware that once we start rolling, we're mighty hard to beat. When they're prepared to strike, they're not likely to give us a chance to tool up.

The constant improvement in our standard of living and in our American way of life is, in a large measure, due to the genius of the contract tool and die shops. Our country is envied by the rest of the world. I know. A few years ago, I had an audience at the Russian Embassy while attempting to bring a relative from behind the Iron Curtain. Our conversation was very brief and I was kept waiting until they discovered I was a tool and die manufacturer.

Believe me, they perked up and made every effort to get information about this industry. Why? Because they have great respect for this terrific force in our country. They recognize this force as our "Hidden Asset"—our power to tool fast, economically. If American industry intends to use this service only in emergencies and to let us drift the rest of the time, the contract tool and die industry cannot expand to meet the unlimited demands of the future. Industry can help us in normal times as we help industry in emergencies.

We mean not to criticize nor to condemn. We only wish to draw attention to what may become a critical situation. It is not only expensive; it could also be fatal. We could be sitting on an open pond like a duck, to be shot at will. The nation which maintains its capacity to produce special tooling shall rule the earth; otherwise, we could see the decline and fall of another great empire.

It has been our purpose today—as it is the main purpose of the local and national tool and die manufacturers' associations— to create a closer understanding of the part contract tool and die shops play in industry. We know that you men possess great understanding and that you are realists, but we also know that under the pressure of present-day industrial life some facts can get away from you.

It would be logical, where a small industry such as ours is concerned, to think in terms of expedience, especially where it may appear on the surface that labor savings and cost savings can result. All we want to do is implant in your mind the thought: Where will you be without us—what will be the long-range cost—to you—to Southern California's industries—to the nation at large—if many of the contract tool and die shops are starved out and become impotent?

Subcontracting Tools and Dies on a Competitive Basis

by Bruce Willsey
Manufacturing Manager
SOLAR AIRCRAFT COMPANY
San Diego, California

SUPPOSE WE try to enumerate some of the advantages and, yes, disadvantages, which industry faces in subcontracting tools and dies on a competitive basis.

First and foremost in importance to any manufacturing company is, or should be, full knowledge of our costs. Tooling is one of the elements comprising these costs and tends to shrink or grow in importance with our competitive position in a changing economy. This in itself is unfortunate because the importance of tooling cost is, in reality, just as much a constant as net profit.

1. In an analysis there are certainly advantages in subcontracting where the demands, in terms of time, require a greater number of hours than is available in our own shops. Herein lies a second advantage.

2. If we plan our toolroom load properly, we can, in our own plant, increase job security and stability by subcontracting beyond our own planned capacity.

3. Also, tooling which is subcontracted can be paid for after completion and tryouts, which means your contract shop has financed part of our costs, which in many instances reduces working-capital requirements.

4. The subcontractor often has access to many more processes and suggestions, due to his work with diversified companies, whereas limited products in our own plant may have narrowed our viewpoint.

5. By curbing our own toolroom equipment to our minimum needs, based on development and maintenance loads, our capital can be diverted to new and modern production machinery.

6. Capital, in this instance, goes farther than merely equipment. There are buildings, the space they occupy, taxes, insurance, and all other charges associated with this operation which receive an overhead account distribution. These funds diverted to new modern machinery and equipment provide the real means to an end—specifically, profit from production.

Disadvantages can be established largely around the feeling of a lack of control. For example, Mr. X, who is responsible for the design and comple-

. . . *Continued on page 66*

. . . Special Tooling, from page 65

tion of tools for a given program, believes it can be better controlled if the job is in our own shop; or he may believe that the costs outside are higher than his own. He may also have some concern over deliveries, and the coordination of changes in product design which affect the finished tool and tool design.

It is my opinion that all of these conditions can be brought under proper control by good organization and planning. These people entrusted to buy tooling should be people with tooling backgrounds; liaison responsibility for controlling changes should be placed with people of the same caliber, and the subcontractor can and will furnish most of the coordination if requested.

In the case of the company which I represent, our tool shop is devoted almost entirely to maintenance of tools. However, this may not fit everyone's needs. Some may find it economically sound to fabricate all tooling outside, as well as design; or the other extreme, others may find it advantageous to do all of their design and tooling within their own plant.

The important thing in any instance is simply this—to know your facts and analyze your costs, and by this I mean all of your costs attendant upon this kind of program; and to base the decision as to extent of subcontracting on complete and valid data. In some cases, it may develop that a change in basic policy is in order.

In our present economy, there is a growing demand, particularly in the aircraft and aircraft engine field, for prototype and pilot line, or limited production, on which time is the essence. To many manufacturers this means that subcontracting must be done on an expedited basis.

Now, if you are accustomed to this practice of subcontracting on a planned basis, and you have an organization trained and equipped to subcontract tooling, the job becomes far easier. Like individuals, however, all tool companies are not the same. Most of them are very good; a few are not so good. Therefore, it is quite clear that we have to know our tooling sources.

If industry could operate on this planned basis of tooling subcontracting, our own operations would reflect more stability in many cases, and this same stability would be reflected in the subcontract operations, with the subcontractor and prime sharing the peaks and valleys established by the national economy.

A trend to retain all tooling within a manufacturing company, on the other hand, will tend to eliminate or dilute the very sources we may need in six weeks or a year.

During World War II, many tool and die shops, as well as design companies, either went into business or expanded their operations. Many of these have since gone out of existence; and, as is also inevitable in a build-up period through the war years, there was some criticism which grew out of that era.

But remember that those who continued and progressed, as well as those who are relatively new, are not operating in the same climate; and, if we look at our own operations, of maybe ten years ago, and compare them with today's standards, perhaps we weren't so hot ourselves.

In many phases of manufacturing the trend seems to be growing more complex, speaking from the standpoint of design. The tooling required to keep pace with this trend and the skills required, cannot be minimized, and they continue to grow in importance both to our industry and our nation.

1943 - NTDMA - 1954

Leading shop owners in the special tool, die and machine industry have derived great business and personal satisfactions from their membership in the National Tool & Die Manufacturers Association because they have given generously and whole-heartedly of their time and effort to insure the success of the group effort. The organization, with now about 900 members, has averaged an annual gain equal to its original membership of 78 in 1943.

Through informative bulletins and surveys, contacts with government agencies, committee studies, encouragement of apprentice training, interesting meetings, and its outstanding color film, "Tool and Die Making — Keystone of Mass Production" and its other public relations activities, the NTDMA is rendering constructive services to its membership and to Industry.

As spokesman for the contract tool and die shops, the NTDMA has gained wide recognition and respect from the public and from Washington for itself and for the industry it represents.

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907 Public Square Building
Cleveland 13, Ohio.

. . . Pneumatic Tools, from page 52

Nut setting is done with the tools used for screw driving by changing the fittings on the ends of the spindles to accommodate the proper nut socket. Smaller, lighter nut setting work is usually handled with tools having adjustable clutches; larger, heavier work, particularly where sections of metal must be pulled together, is usually done by pneumatic wrenches or impact wrenches.

Pneumatic Wrenches

Pneumatic wrenches are essentially air drills with spindles arranged to accommodate nut running sockets. They deliver a continuous and positive torque and are the most convenient and reliable machines available for many nut running applications. They are light in weight, simple, usually requiring no kick-out or cushion clutches, safe and will not over-heat under load.

Accurate torque limitation is obtained by the selection of the proper tool for the particular application. In operation, the nut is driven until the wrench stalls. As long as the wrench is kept in a reasonable state of repair and the air pressure maintained within reasonable limits, stalling will occur at approximately constant torque. Different torque requirements can be met by varying the air pressure furnished to the tool by means of a pressure regulator.

Machines are available in sizes ranging from units weighing a little over a pound in weight and capable of developing a torque of approximately 1/2 foot-pounds, to machines weighing about 200 pounds and developing a torque exceeding 2000 foot-pounds torque. They can be furnished with various angle attachments, handle arrangements, and means suspension.

Impact Wrenches

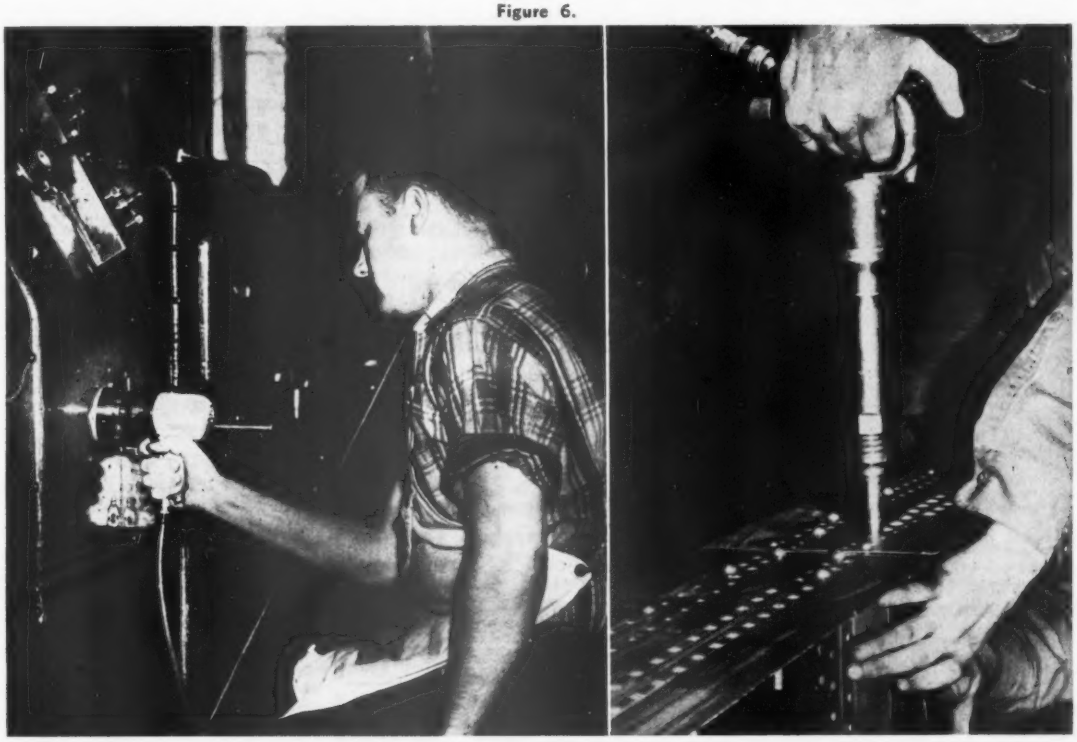
Pneumatic impact wrenches are designed to tighten or remove nuts by rotary or torsional impacts (Figure 6). This type of action has the same effect on the nut being driven or removed as would be obtained by using an ordinary hand wrench and striking it with a hammer or sledge. Thus, it is possible to remove large nuts which have become frozen and which could not otherwise be taken off without splitting or burning.

Due to the fact the turning action of the machine is developed by rapid impacts, the torque reaction on the operator is practically eliminated. For example, it is possible for an operator to take the torque reaction with one hand while the machine is delivering impacts to the nut equivalent to a torque of 400 or 500 foot-pounds.

The savings resulting from the use of impact wrenches vary with the type of work being done, but there is ample data to support the conclusion that a saving of from 70 to 80 per

. . . *Continued on page 156*

Figure 6.



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WHY SWAGING FOR HIGH PRODUCTION?

Today's economy is directing new attention to rotary swaging for achieving difficult contours and increased properties on work-pieces fabricated from rod or tubing.

Two or four swaging dies arranged radially around the stock permits the use of hammer rolls held in a planetary rack to deliver their impact from opposite directions, forcing the rotating dies together and against the stock. With proper die design and controlled feed, reduction of the work to desired dimensions and contour is achieved along with high surface finish and improved physicals.

For your copy of a new 38-page catalog that describes various swaging machines as well as the general art of swaging, write to The Torrington Company, Torrington, Conn., or— **Circle D3**

NEW CARBIDE IS INTRODUCED FOR MACHINING STEEL

A new type of cemented carbide that looks very promising as a cutting material has been announced by Firth Sterling Inc. The new material contains no tungsten and no cobalt, both of which are in critical demand during all-out defense production. Instead, this new member of the carbide family is essentially titanium carbide, with molybdenum as an alloy addition, and with nickel used as a binder.

Four years ago, company metallurgists studied English, Austrian and German techniques of producing titanium carbide, the basic ingredient of this new metal. Having adapted the best features of these European processes, Firth Sterling, through extensive research, has developed this superior titanium carbide cutting material.

The tungsten free grades are characterized by high wear resistance, and the cratering action of steel chips is greatly reduced. Tool life is excellent on steady finishing cuts, particularly when high speeds and fine feeds are employed in machining hard abrasive steels. The new grades remain much cooler than tungsten carbide grades when cutting steel without fluids.

. . . Production or Profit, from page 48

It was found that shipping costs are not a major factor in determining maximum profit. This is shown by the fact that use of the highest-profit table would increase profits by $300,000 over the original proposed policy and by $350,000 over profits realized by last year's production. The $300,000 profit increase constitutes the cumulative opportunity profit. This profit is not realized by cost reduction or by increased production, but solely by the opportunity profits of all items considered simultaneously.

Conclusions

The findings and data, that we have just discussed, are ready for use as soon as the final report is handed in to management. In spite of the rather complex mathematics involved, the only requirement on the part of management is that they understand the use of the tables.

With these tables, it is possible to work from either the highest profit or the production table (depending on your objective) to determine the whole program for the coming year. Once a policy has been established, it is a simple matter to refer to the table when making a decision between producing or purchasing.

All the profit figures are based on present capacity and forecasts. Naturally, as sales and capacity are expanded, the same possibilities exist on a larger scale.

As a follow-up to the profits study, Linear Programming is now being used in the Tube Mill to build weekly schedules for maximum utilization of equipment. This type of program ties together the allocation procedure and the scheduling phase, which are normally treated separately.

The profits study is just one example of the many ways in which Linear Programming may be used to increase company profits or reduce costs. This type of approach can be applied to any industry which has the problem of making outside purchases to supplement their line, or the comparable problem of subcontracting many of the components for an end product.

Linear Programming is being used successfully for a wide range of management problems other than direct profit studies. Examples include salary evaluation, production scheduling, inventory control, and market research.

Plastic Rings Efficient As Shaft Retainers

Easier, faster, and more economical assembly and positive holding power are advantages claimed for a new type plastic shaft-retainer ring.

The new Plasti-Ring is expected to be used extensively in the automotive, aircraft, electrical, business machine, and toy industries. It will provide greater retaining power at lower cost and can frequently replace such holding devices as cotter pins, nuts, split rings, snap rings, some cotter keys, bent and coiled wires, plain or tapered pins, and other fasteners used in holding two or more parts together relative to one another.

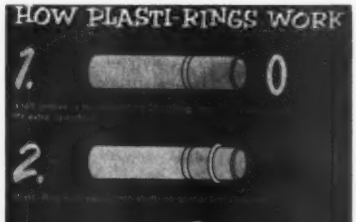

Photo courtesy of Shakeproof, Illinois Tool Works.

When force is exerted, the Plasti-Ring tends to imbed itself more firmly in the groove to serve as a thrust bearing, with secure retention of any member on the shaft.

Plasti-Rings are easily rolled into a prepared groove to serve as a positive-holding shoulder, highly resistant to friction and wear. They will withstand up to 250 lbs. in direct shear. Because of their light weight, they do not create motion force which might injure assembly.

The ring is injection molded of oil-and-grease-resistant vinyl, with high friction resistance and long wearing qualities. Air hammer vibration tests and cycle tests on solenoid arms show that the new retainer can withstand 10 million operations without failure.

Good looks, easy and economical application and service reliability are advantages of the Plasti-Ring as applied to this electrical switch where it serves as a retainer on the plunger.

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"DO's & DON'T's"

This manual shows proper degreaser operating methods with brief text and a profusion of illustrations. The literature covers every phase of

metal cleaning through vapor degreasing, including safety, personnel, correct layout and maintenance of equipment, efficient operations, drainage, machines and chemicals. Each phase is pictorially depicted showing the "right" and "wrong" methods. The manual is published by the Manufacturers Processing Co., 1360 Hilton Rd., Detroit 20, Mich.
Circle Inform-A-Gram No. C1.

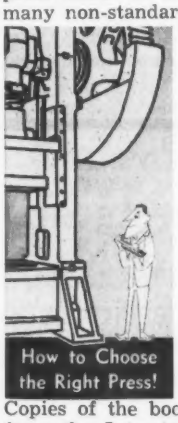
Surface Cutting Speeds for various grades of cold finished steels on automatic screw machines are provided on a data chart (Sec. F, No. 6,) which is being offered by Peter A. Frasse & Co., Inc., 17 Grand St., New York 13, N. Y.
Circle Inform-A-Gram No. C2.

Seven Helpful Hints on the care and use of industrial diamonds are contained on a chart suitable for hanging in a shop and available from the United Diamond Tool Corp., 51 Prospect Ave., Lynbrook, L. I., N. Y.
Circle Inform-A-Gram No. C3.

Carbide Tipped Saws. "How to Sharpen and Care for Carbide Tipped Wood Cutting Saws" is the title of an illustrated manual offered by the Simonds Saw and Steel Co., Fitchburg, Mass. The booklet includes such data as how to sharpen dado heads; how to get maximum saw production and performance; operating do's and don't's; plus drawings depicting clearance and relief angles of the various tooth styles.
Circle Inform-A-Gram No. C4.

FOR PRESS USERS. . .

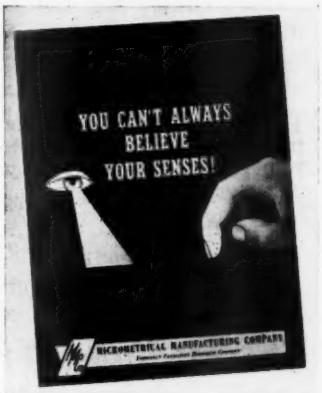
Here is an instructive new booklet which will be quite helpful to many press users. It defines some of the many non-standard press terms and



discusses factors in selecting the correct press, type of power, frame design, and important accessories. The last section includes a formula for determining tonnages and a chart showing safe tonnage on single crank presses. Each frame type is clearly illustrated and labeled. Copies of the booklet are available from the Interstate Machinery Co., 1465 West Pershing Rd., Chicago 9, Ill.
Circle Inform-A-Gram No. C5.

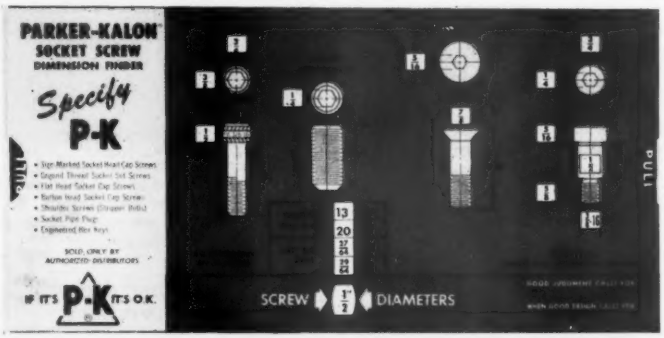
SURFACE ROUGHNESS. . .

Surface roughness rating by "feel" and by visual comparison are discussed in a booklet offered by the Micrometrical Mfg. Co., 345 S. Main

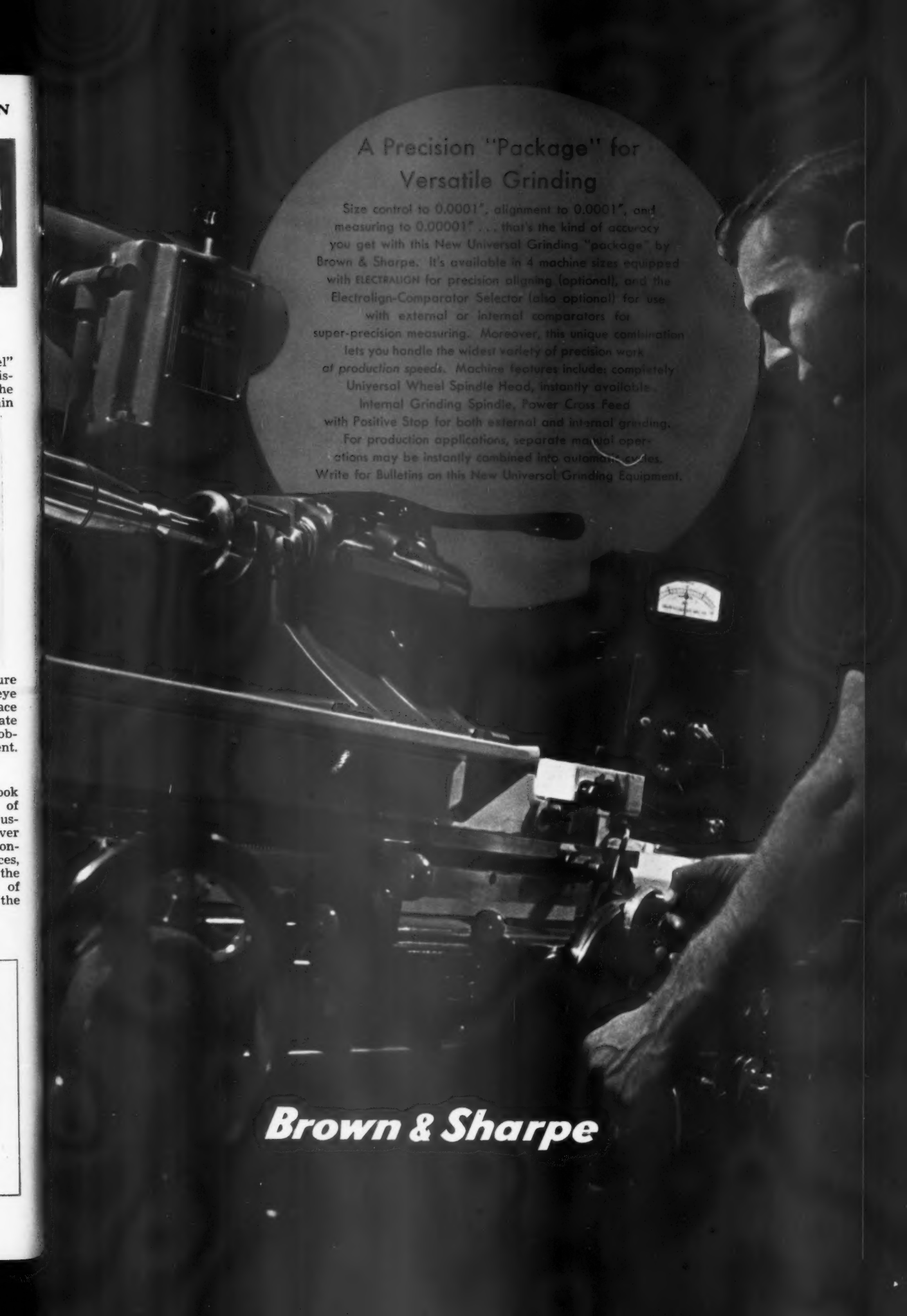


St., Ann Arbor, Mich. The brochure tells of the inaccuracy of the eye and fingernail in measuring surface roughness. It explains how accurate roughness ratings can only be obtained by instrumental measurement.
Circle Inform-A-Gram No. C6.

Coated Abrasives. A handbook prepared for the enlightenment of the coated abrasive industry customer is being offered by the Clover Mfg. Co., Norwalk, Conn. It contains 36 pages giving the sources, preparation and characteristics of the abrasives, kind and preparation of the backing, adhesives, and the method of manufacturing.
Circle Inform-A-Gram No. C7.



This Socket Screw Dimension Finder is offered to TOOLING and PRODUCTION Magazine readers by the Parker-Kalon Division of the General American Transportation Corp., 200 Varick St., New York 14, N. Y. On the side you are looking at are thread and tap drill sizes. The other side contains button head and pipe plug dimensions. You can get one of these calculators by writing direct to the company, or—
Circle Inform-A-Gram No. C8.


A Precision "Package" for
Versatile Grinding
Size control to 0.0001", alignment to 0.0001", and measuring to 0.00001" . . . that's the kind of accuracy you get with this New Universal Grinding "package" by Brown & Sharpe. It's available in 4 machine sizes equipped with ELECTRALIGN for precision aligning (optional), and the Electralign-Comparator Selector (also optional) for use with external or internal comparators for super-precision measuring. Moreover, this unique combination lets you handle the widest variety of precision work at production speeds. Machine features include: completely Universal Wheel Spindle Head, instantly available Internal Grinding Spindle, Power Cross Feed with Positive Stop for both external and internal grinding. For production applications, separate manual operations may be instantly combined into automatic cycles. Write for Bulletins on this New Universal Grinding Equipment.
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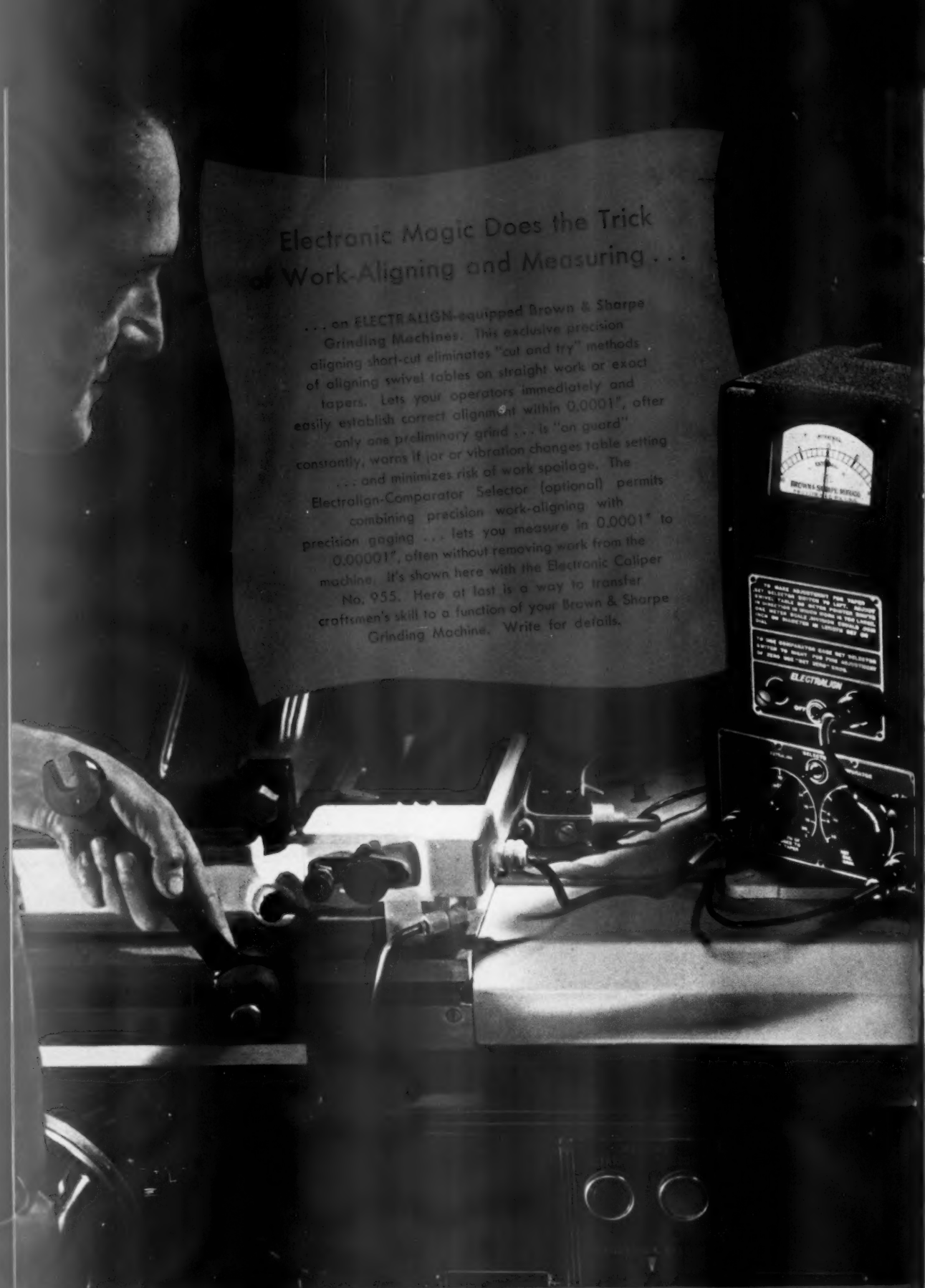
Electronic Magic Does the Trick of Work-Aligning and Measuring . . .
. . . on ELECTRALIGN-equipped Brown & Sharpe Grinding Machines. This exclusive precision aligning short-cut eliminates "cut and try" methods of aligning swivel tables on straight work or exact tapers. Lets your operators immediately and easily establish correct alignment within 0.0001", after only one preliminary grind . . . is "on guard" constantly, warns if jar or vibration changes table setting . . . and minimizes risk of work spoilage. The Electralign-Comparator Selector (optional) permits combining precision work-aligning with precision gaging . . . lets you measure in 0.0001" to 0.00001", often without removing work from the machine. It's shown here with the Electronic Caliper No. 955. Here at last is a way to transfer craftsmen's skill to a function of your Brown & Sharpe Grinding Machine. Write for details.
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Johansson Gage Blocks
Permanent Magnet Chucks • Pumps

SAFETY FIRST .... A MUST

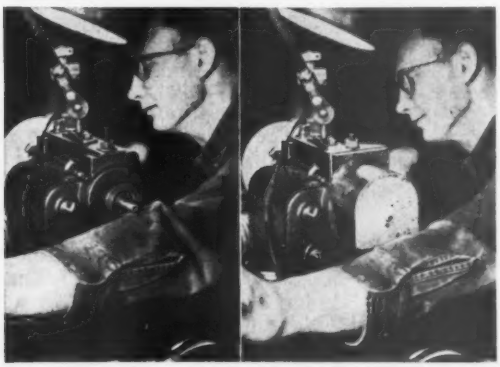
by Gale Whitacre
Supervisor, Tool Grinding
THE NATIONAL SUPPLY CO.
Torrance, Calif.

PLANT SAFETY is largely a matter of recognizing where potential dangers exist, and guarding against them. This means endeavoring to guard against the rare, "once in a million" type of accident as well as against obvious dangers.

Everybody recognizes that a rotating saw, or a rotating grinding wheel, can be dangerous. The phrase, "never monkey with the buzz saw," has come into widespread use. But it is less customary to think of a rotating spindle as a possible cause of accidents.

Yet an innocent-looking spindle may be the means of catching a man's sleeve and throwing him against the saw or wheel at the opposite end. A number of serious accidents have been caused in that way.

We are proud that in the Tool Grinding Section at the Torrence plant of the National Supply Company there has not been a disabling injury in more than ten years. We hope to extend that record for many more years.



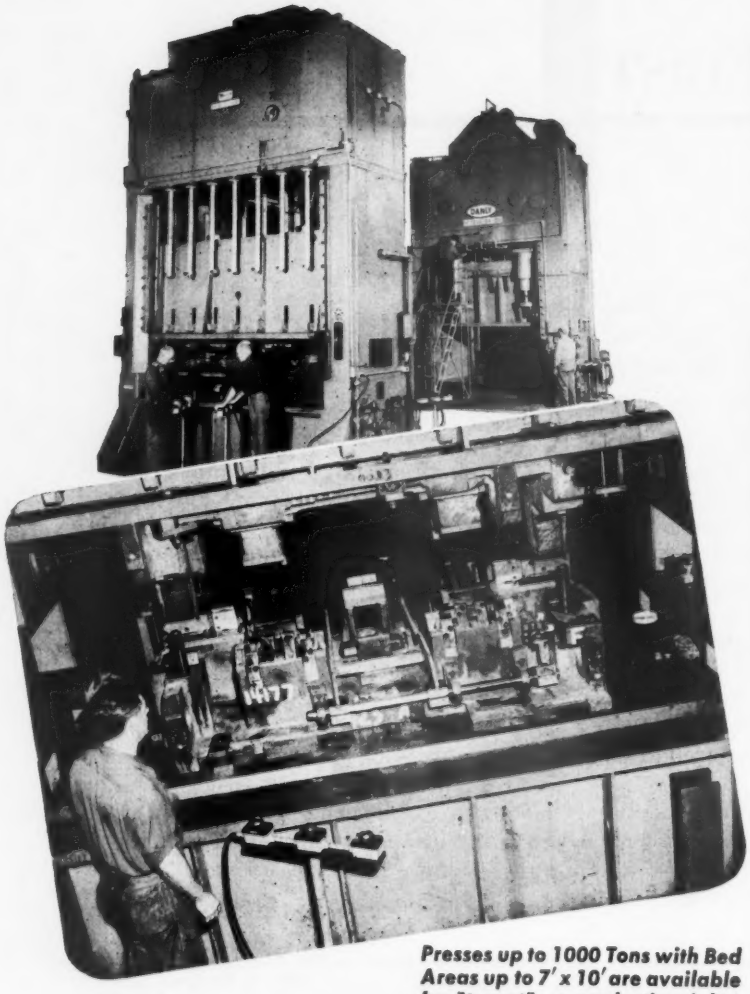
A lesson in safety is illustrated in these "before and after" pictures taken in the Tool Grinding Section of The National Supply Co. plant at Torrance, Calif. Exposed spindle of grinding machine is apt to catch sleeve of operator and throw him against the grinding wheel. In the second picture a simple housing for the spindle end eliminates the possibility of such injury.

Our plant is a large and complex one; it is described as the largest completely integrated machinery manufacturing plant in the West. A large amount of machine tooling is performed, requiring the use of a wide variety of grinding tools and machines. So we face a big problem in operating the tool service departments safely and efficiently.

A large, well-lighted and well-ventilated area is provided. The floor layout provides adequate working space for each man and allows for wide, uncluttered aisleways. Equipment and workbenches are kept clean. Adequate facilities for materials handling are provided. Safety rules are enforced.

. . . *Continued on page 104*

Safety is a "Must" in the Tool Grinding Section of The National Supply Co. plant at Torrance, Calif., as illustrated in this photograph. Note the uncluttered aisle, clean equipment and work benches, and the excellent illumination. A concave metal shield, painted in a light color, stands before each machine at which there is an exposed grinding wheel. Nozzles of the dust collection system carry dust from the grinding operations to the master exhaust pipes overhead.



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CIRCLE INFORM-A-GRAM KEY NO. 74

SMALL RADII ARE PRECISION GROUND WITH NEW FIXTURE

The A1-Maur master grinding and checking fixture makes it easy to grind and check tools, gages, and similar parts requiring small, exacting, close-tolerance radii. The fixture grinds all angles from 0° to a full 180° and radii from as small as 0.001″

Photo courtesy of DeSoto Tool Co.

The A1-Maur fixture as shown in action holding a workpiece that is being ground on a surface grinder using a straight cup wheel which has been dressed on its face.

and upwards, to tolerances as close as 0.0001″. Any mechanic of average ability will now be able to do this work with ease. All the mechanic has to do is properly set up the fixture and the result he wants must occur.

The design of the fixture utilizes sound but complex theoretical principles and mathmetics which even the best toolmakers have always found difficult to apply in everyday shop practice.

The fixture consists of a hardened and ground steel base and a removable steel body. The base has a hardened and ground lapped bushing, and two hardened and ground stop pins, projecting from its top surface. A hole in the bushing establishes the zero point for the base and permits the body to be relocated easily and accurately. The left hand stop pin serves as a stop for the left side of the body; the right hand stop pin serves as a stop for the right side of the body.

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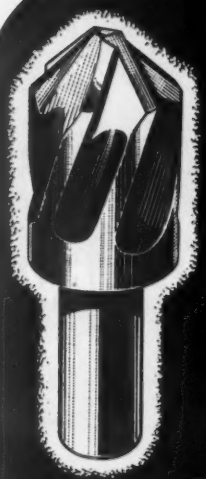
CIRCLE INFORM-A-GRAM KEY NO. 75

HOW IMPORTANT IS

CHATTERLESS COUNTERSINKING To You?



The Severance Chatterless Countersink is Engineered for today's fast production schedules. It will give you what you've always wanted in a countersink—

CHATTERLESS ACTION
SMOOTH SEATS
FAST CUTTING
LONG SERVICE

Take advantage of last minute developments in countersink design—
Save Time and Money!
Order Directly From This Ad.

Severance CHATTERLESS COUNTERSINK SET No. 27

Set No. 27 contains a 1/4", 3/8", 1/2", and 3/4" countersink. These sizes will cover a big majority of your countersinking operations. They'll come to you in a specially designed case which closes flat so as to fit in standard tool-box drawers. Order by Set No. with centerline angle desired, thus: 1 only Set No. 27-41°; 10 only Set No. 27-45°, etc.

SEVERANCE CHATTERLESS COUNTERSINK SET No. 27 including Flat Wooden Case $9.50
*Plus 10% in less than 10 Sets.

TOOL NO	BODY DIA.	SHANK DIA.	*LIST PRICE
BA	3/16	3/16	1.30
CB	1/4	3/16	1.30
DC	5/16	1/4	1.60
EC	3/8	1/4	1.85
GD	1/2	3/8	2.40
IE	5/8	3/8	3.50
JF	3/4	1/2	4.60
KG	7/8	1/2	5.75
LI	1	1/2	7.00
NJ	1 1/4	3/4	10.25
PK	1 1/2	3/4	13.65
RL	1 3/4	1	17.10
SM	2	1	20.50

WHEN ORDERING GIVE: TOOL NO. AND CENTER-LINE ANGLE DESIRED.
THUS: 12 ONLY CB-30°; 24 ONLY GD-41°; ETC.
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CIRCLE INFORM-A-GRAM KEY NO. 76

R. N. Jorgenson Joins T&P Sales Staff

Richard N. Jorgenson, a veteran in the industrial sales field, has been appointed New England Regional Representative for TOOLING and PRODUCTION Magazine.

Besides serving as a representative for several other business publications prior to joining T & P, Mr. Jorgenson spent two years covering the Massachusetts and Rhode Island territory for Merrill & Usher Company of Worcester.

R. N. Jorgenson

According to George J. Huebner, publisher of T & P, the growth of business and the extensiveness of the Eastern area made it necessary to add another representative in order to better serve that territory.

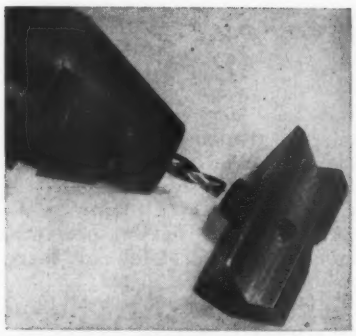
Mr. Huebner also reports that Thayer Heaton will continue to represent the magazine in Eastern New York, New Jersey, Pennsylvania, Delaware and Maryland and will still maintain offices at his present address in New York.

Adaptor On Air Router Fits It For Chamfering

One manufacturing plant has adapted its ½" air routers for chamfering by adding a 1" x 2" notched steel guide to the ends of the routers. These guides are expected to save $3,000 annually in man-hours that normally would be spent hand-filing chamfers on certain aircraft parts.

Billy Childress, general assembly leadman at the Dallas plant of TEMCO Aircraft Corp., developed the chamfer guide for use on any standard Quackenbush or Onsrud router. His guides are designed to route a 45° chamfer.

To get the desired angle, he milled a 90° triangular notch in one side of the guide block. The notch is at 45° to the router blade, which passes through a hole bored in the center of the block. The blade is exposed in the hole where it intersects the triangular notch. The relation-



Chamfer guide is pictured here beside a Quackenbush air router to which it attaches. When the two are screwed together, the router blade is slightly exposed by the hole in the notched guide. This allows the blade to cut the desired chamfer on the part against which the guide block is fitted.

ship of the hole to the seat of the notch determines the width of the chamfer.

The hole that encloses the blade is threaded at one end so it can be screwed on the end of the router. By pressing the notch snugly against the edge to be chamfered, the operator is assured a quick and uniform cut. Notches can be cut to provide any chamfer angle.

$16 Billion Fight on Obsolescence Forecast for '54

An estimate that more than $16 billion will be invested by U. S. industry this year to modernize plant facilities and equipment was made recently.

Speaking before a meeting of the Instrument Society of America, industrialist Henry F. Dever of Philadelphia declared that this money—roughly 60% of the estimated $27 billion slated for capital expenditures in 1954—would be needed to combat technological obsolescence and to sustain industrial growth. Mr. Dever, president of the Brown Instruments Division of Minneapolis-Honeywell Regulator Company, said industry faced a squeeze between rising payroll costs and competitive selling prices—a situation aggravated by the obsolescence factor which itself has been given impetus by evolutionary changes in production techniques.

. . . Continued on page 80

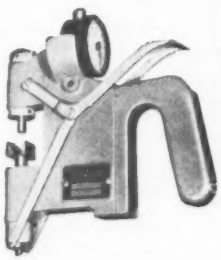
Why You Should Prefer a

LINCOLN PARK DIAL SNAP GAGE

There are scores of advantages in using any products made by Lincoln Park Industries. Read these regarding the Dial Snap Gages:

- Lincoln Park Dial Snap Gages are designed to give direct reading from the measuring anvil to indicator.
- There are no bearings, levers or cams to get out of order.
- By means of its fine pitch ground thread screw attachment, the upper anvil can be adjusted within a ¼" range.
- Even when used by inexperienced operators, Lincoln Park Dial Snap Gages present no possibility of damage by accidental shock. The indicators themselves are encased in a housing to protect them from damage.
- Because these gages have a minimum of parts to wear or be replaced, maintenance is negligible and long-trouble-free operation is assured.
- The parallel anvils are carbide-tipped.

STANDARD GAGE—size range from 0 to 5" (special length gage for crankshaft inspection shown).



RETRACTOR TYPE—for gear or spline checking. Special anvils can be supplied.

SPECIAL BENCH TYPE—with carbide ball anvils, for checking pitch diameters.

BENCH or COMPARATOR TYPE—for checking small parts.

THE PLUS IN PRECISION

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CIRCLE INFORM-A-GRAM KEY NO. 77

ONLY DIEBEL PRESSES HAVE THE EXCLUSIVE

CYLINDRICAL RAM

STOPS ABNORMAL DIE DULLING

Misalignment of punch and die because of inadequate gibbing is the major cause of abnormal die dulling and short die life. The V-shaped gibs on conventional presses do not offer enough guiding surface, regardless of length, to assure positive alignment in day in day out mass production.

Diebel's cylindrical ram design affords maximum guiding surface and guarantees accurate punch and die alignment.

The exclusive cylindrical ram is another proof that DIEBEL PRESSES are designed, engineered and built with the die in mind.

DIEBEL HI-PRODUCTION AUTOMATIC PRESSES

Compare the tremendous amount of precision guiding surface of the cylindrical ram with the V-shaped gibs that guide the ram on conventional presses.

DI MACHINE CORP.

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CIRCLE INFORM-A-GRAM KEY NO. 78

Magic Tool And Die Checker

A fast, accurate and simple method of measuring punch and die clearance is assured by this newly developed tool and die checker. Invented by a diemaker with many years' experience, including supervision of large

die and tool making departments, it was developed to reduce the time of finishing and inspecting die openings.

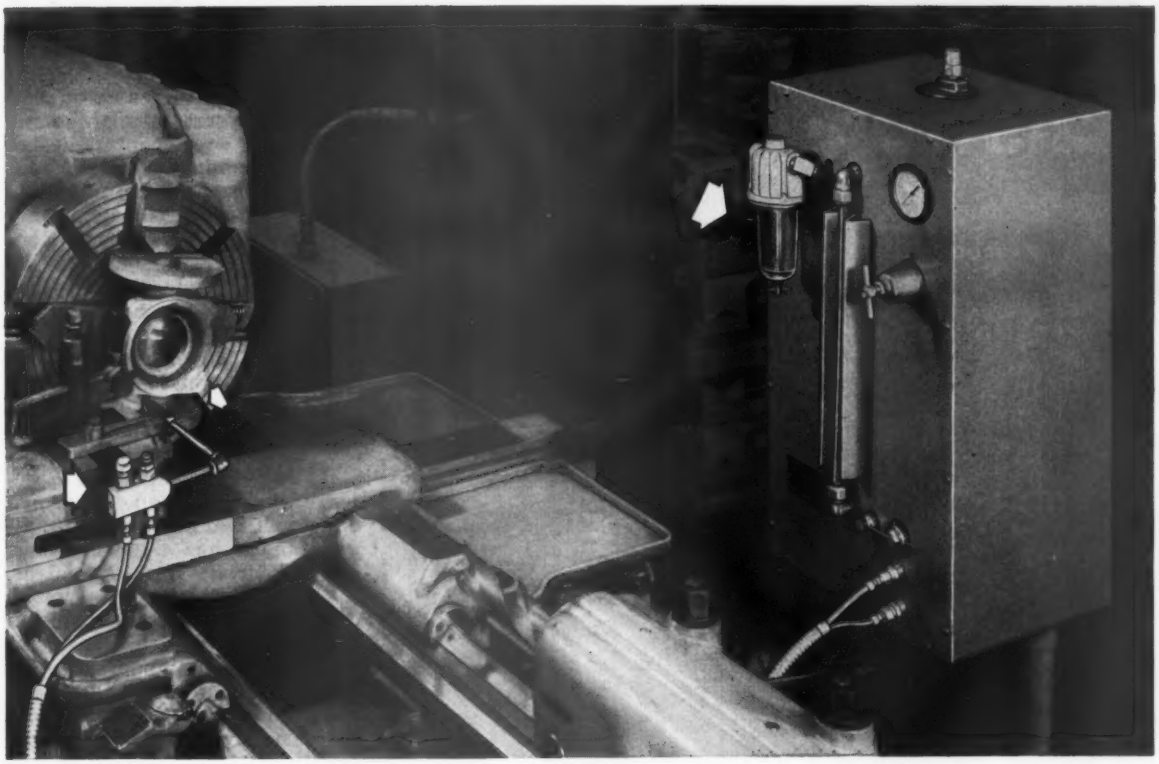
The checker measuring spindle has a travel of 1" and, as it registers the die clearance or relief angle, the indicator dial translates the result into thousandths of an inch. The instrument has a working range of from 7° negative to 7° positive.

With the checker positioned adjacent to the die opening, as shown, the diemaker or inspector slides the indicator assembly so that the ball end of the spindle travels over and bears against the surface of the die opening. If the opening has no taper, the indicator dial reads zero throughout the spindle travel.

For further information write direct to Magic Engineering Service, 913 S. W. 11th Ave., Miami 36, Fla., or—
Inform-A-Gram Key No. D1.

For Your Future

U. S. SAVINGS BONDS



LO-JET ACRO

'TURNS-OFF THE HEAT' } turns-up profits and production

Lo-Jet Cools And Lubricates

Lo-Jet ACRO is a pressurized mist system that provides both evaporative cooling of tools and work, and lubrication, to reduce friction generated heat. Because it's pressurized, Lo-Jet delivers cooling and lubrication uniformly, too, regardless of operational conditions.

Lo-Jet Pays For Itself In Reduced Costs

Lo-Jet ACRO increases tool life 100%-300%, and the resultant savings in tool cost alone soon pay for the unit. The Lo-Jet costs less to operate, too.

Lo-Jet Increases Production

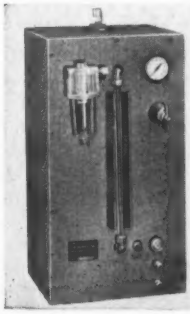
With Lo-Jet ACRO on the job, you can take heavier cuts on any work, and operate at higher feeds and speeds. And because tools last longer, there is a drastic reduction in the amount of tool-change time required.

Lo-Jet Provides Better, Cleaner, Safer Operation

The directed cooling and lubrication of Lo-Jet ACRO result in improved finishes. Lo-Jet leaves the tool and work plainly visible and clean at all times. The ACRO coolant used is fireproof, lightly pine-scented, absolutely non-toxic to humans.

Lo-Jet Is Versatile And Easy To Install

Lo-Jet ACRO is completely self-contained, and can be installed on any cutting machine in minutes! It eliminates expensive, messy pumps, sumps, and piping. It can be used in turning, grinding, milling, drilling, tapping, and reaming. It's ideal for multi-phase, high speed operations, because it can be used to control as many as six nozzles at once, with full pressure and separate controls for each tool.



Don't let your profits and production go up in smoke! Mail the coupon now for literature that tells how to improve all cutting operations with

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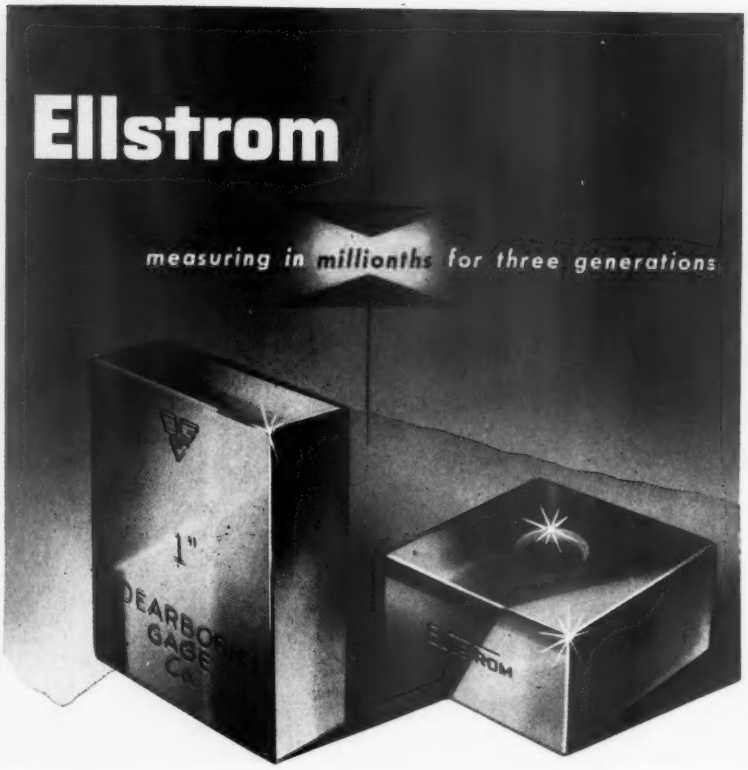

Here are GAGE BLOCKS that invite your most critical inspection!

WE'RE "fussy" about the gage blocks we make. And we hope, when *you* buy a set, that you'll be fussy, too. Because only by your own critical, impartial inspection of each individual block can you come to appreciate the true full measure of quality, value, and dependability inherent in Ellstrom Chromium Plated Standards.

Yes, we'd like you to check any set of Ellstrom gage blocks that meets your particular inspection or production requirements. Check them block-by-block for size . . . for their consistent adherence to closer than specified accuracy. For flatness . . . parallelism . . . and the finish of their hard, uniform chromium plated gaging surfaces that give you greater serviceability, longer wearing millionths. And, too, test the fine materials used in their manufacture . . . for coefficient of expansion and controlled metallurgical stability. Then, we're sure, you'll agree that it pays to standardize on Ellstrom Standards.

IF YOU BUY GAGE BLOCKS, send for your free copy of this new Ellstrom Standards Catalog. Contains complete specifications and prices on the entire Ellstrom line of gage block sets, accessories, individual blocks, wear blocks, inspection service and trade-in plan. Write today!

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Originators of Chromium Plated Gage Blocks

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

CIRCLE INFORM-A-GRAM KEY NO. 80

. . . Obsolescence, from page 77

"These conditions inexorably lead to emphasis on more efficient capacity, increases in cost-cutting efficiency, new automatic production equipment, redesign of uneconomically spread - out plants, new materials handling and improved cost accounting procedures," Mr. Dever contended. Over-all efficiency, he asserted, cannot be increased simply by closing the old, obsolete plants. This, he feels, would not only endanger the company's relative position in its markets but would also limit its chances to expand. Modernization, he said, is the practical answer.

He saw the completion of defense expansion and the return of competition as factors that already have had their influence on industrial spending plans. In 1948—the last year prior to the defense-supported expansion wave—industry divided its capital expenditures, then some $14 billion, about equally between expansion and modernization. The Korean war, however, became a powerful force for expansion. Corporations, particularly the larger ones, poured vast amounts of money into expansion of productive facilities. Now, he said, the emphasis is turning toward modernization.

In 1952 some 51% of the total expenditures was directed toward modernization. Last year it rose to about 57% and for the next three years most estimates put it between 60 and 62%, Mr. Dever explained.

In the long run, Mr. Dever said, the "real basis for growth—for both small and large corporations—lies in the steady flow of new production ideas implemented by investing in better equipment and new processes."

TITANIUM SERVICE BEING EXPANDED

Mallory-Sharon Titanium Corporation — a leading supplier of titanium sheet, cast ingots, and hot-rolled or forged bars and rounds — is expanding its engineering service organization. The company feels this will be of great help to Industry because of this metal's being on the threshold of volume production and because of the rapid advance-

ments being made in fabricating techniques.

Andrew N. Eshman, formerly chairman of North American Aviation's Titanium Committee, has been given responsibility for Mallory-Sharon's engineering service relative to fabrication and processing of titanium sheet.

L. M. Gary, formerly a consultant specializing on forging problems and an advisor to the NPA Light Metals Division, will be responsible for technical assistance in the development and improvement of forging and fabricating techniques.

Sectional Transfer Machines Use All-Welded Bases

New sectional transfer machines to perform the multiple job of drilling, boring, spot-facing, reaming, and tapping on transmission cases, cylinder blocks, and crankcases are now being built by the Baush Machine Tool Company. Designed to meet the automotive industry's increased requirements for high speed operation with a minimum of downtime, these machines incorporate steel bottom and center bases fabricated by Acme Welding, division of The United Tool & Die Company, West Hartford, Conn.

Before Baush engineers designed this transfer machine with the sectional principle, automotive manufacturers faced the problem of costly downtime. The latter amounted to a virtual work stoppage whenever even a minor change was made in the design of the workpiece, because each unit in the transfer line was too closely integrated with the next to allow easy changeover. With the new Baush sectional design, the now independent segments of the machine can be readily adapted to changes in the work with no decrease in output.

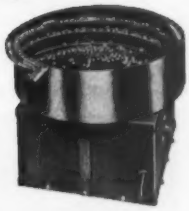
According to Baush's Chief Engineer, all-welded bases were specified for this complex, heavy-duty machine because of the greater strength and rigidity required by its high-speed operation. He then added that the welded design enabled Baush to incorporate many intricate design features that would not have been possible with any other type of construction.

Now! Greater than Ever
FACILITIES
TO MEET YOUR ASSEMBLING REQUIREMENTS!

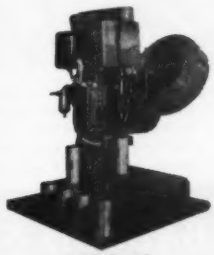
POWER SCREWDRIVERS
SELECTIVE PARTS FEEDERS
SPECIAL ASSEMBLING MACHINES
EXTENDED ENGINEERING SERVICE

POWER SCREWDRIVER

BARREL FEEDER


BOWL FEEDER

● Action . . . More Action . . . in your assembly department! More Speed . . . Greater Accuracy . . . Lower Costs . . . Vital factors in your production program. Advantages available to you through the DPS expanded line and increased manufacturing facilities. Tell us your story. Let our trained engineers analyze your problem . . . Whatever your feeding and assembling operations may be, they will come up with a practical solution.


SPECIAL ASSEMBLING MACHINE

GIVE US THE DETAILS . . . SEND SAMPLE ASSEMBLY.

DETROIT POWER SCREWDRIVER CO.
2827 W. FORT ST. DETROIT 16, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 81

NEW Bausch & Lomb BENCH COMPARATOR For Only $765!

NOW! LOW COST, FAST OPTICAL INSPECTION!

Here's how you save *every way* with this new Bausch & Lomb Bench Comparator. Save inspection costs—expensive holding fixtures no longer needed for most work. Save inspection time—no complicated set-up. Simply lay most kinds of work on table . . . see accurately magnified silhouette at eye level on 10" screen—biggest screen, with biggest field, in this low price range. Makes accurate inspection so easy that a new operator can quickly keep pace with capacity production. Often reduces many complicated measurements into one easy, fast visual check. Save by nipping costly production errors in the bud. And of course you save on purchase price—a workable unit for only $765. Put this new, dependable B&L Bench Comparator to work on *your* production.

Make fast, accurate measurements with the easily attached micrometer stage. (Optional at small extra cost.) Reads to 0.0001".

SOLD AND DISTRIBUTED EXCLUSIVELY BY THE DoALL COMPANY

For full information, call your local DoALL Sales-Service Store, or write: The DoALL Company, 294 N. Laurel, Des Plaines, Illinois.

BAUSCH & LOMB
SINCE B&L 1853
Quality Control
INSTRUMENTS

CIRCLE INFORM-A-GRAM KEY NO. 82

FILM SHOWS HOW VOLKERT MAKES PRECISION PARTS

"Stampings for Electronics," a 20 minute 16-mm color and sound motion picture shows how millions of precision parts are produced daily for the fast-growing electronics industry.

The film is available from John Volkert Metal Stampings, Inc., 222-34 96th Ave., Queens Village 8, L. I., N. Y., for showings to industrial management, technical societies, and other groups.

The film takes the viewers into each of Volkert's departments — design engineering, tooling, production, inspection, finishing, assembly, warehousing and shipping.

Depicting how accurate progressive dies are designed, built and put to work in automatic production equipment in the plant, the film demonstrates the "precision-in-production" method that has lowered stamping costs.

Volkert's volume stampings production is geared to the industry's volume production of radio and television sets, electronic tubes, radar, military communications equipment, and a wide variety of other electronic assemblies.

PROFILING HEAD PERMITS INTERNAL, EXTERNAL TURNING

A recently developed profiling head permits the turning of both internal and external profiles, provided the forms of such profiles allow the tool bit to be engaged in a continuous cut. Built for heavy-duty operation, the body of the attachment is drop forged and all movable parts are case hardened.

The head can be used in turning square, hexagonal, octagonal, and other polynomial profiles. Specific products which can be produced with the head include profile collets; stamping, drawing and forging dies; gages; special tools; and other products. The head can also be used to machine cylindrical and taper forms (punch and die tapers).

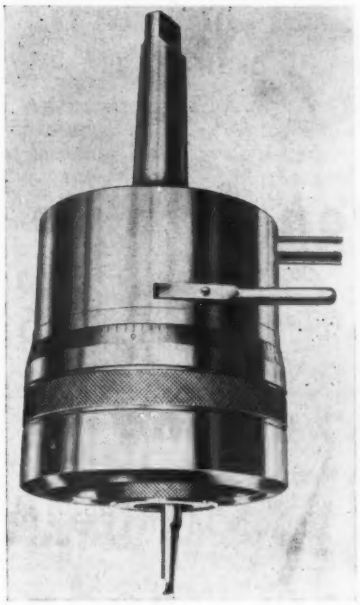


Photo courtesy of Alina Corp.

To use this head, a templet of the form which is required in the finished product is inserted in the head, the design of which allows for easy interchangeability of these templets. The templets are approximately ¼″ thick and can be easily made in the shop. One templet permits the machining of an unlimited number of pieces, the dimensions of which may vary as much as ¾″ this being the capacity of the adjusting barrel. Templets may be made of molded nylon or of mild steel. Complicated profiles are machined by using progressive templets. The form of the templet is transmitted to the workpiece by a roller guide. An ordinary boring tool bit may be used for turning of profiles, thus eliminating the need for special tools. The provision of a micrometer scale on the adjusting barrel is said to assure an accuracy of ± 0.0005″. The profiling head can machine profiles with corner radii of less than 0.02″.

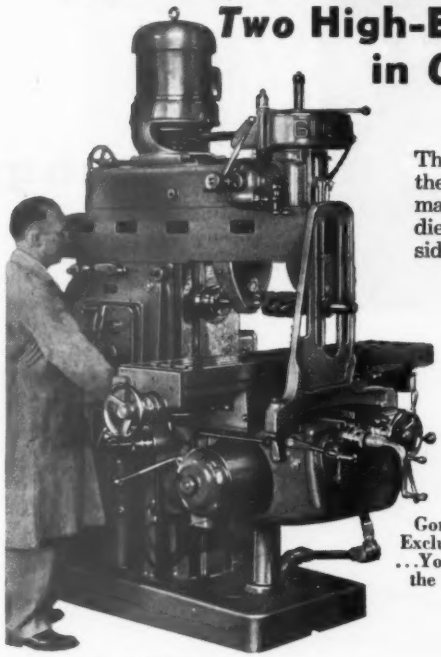
NON-SHRINK MATERIAL FOR DIE MODELS & PATTERNS

Joint research by Ford Motor Company's Engineering Staff and the U. S. Agriculture Department's Forest Products Laboratory has proved the suitability of

. . . *Continued on page 90*

New Gorton 2-28 Brings You *Two* High-Efficiency Mills in *One* Money-Saving Unit

The Gorton Receptor Ram makes the new 2-28 a true multi-purpose machine . . . "tailor-made" for *all* die-mold-machine shops. Consider the facts:



. . . as a horizontal mill.

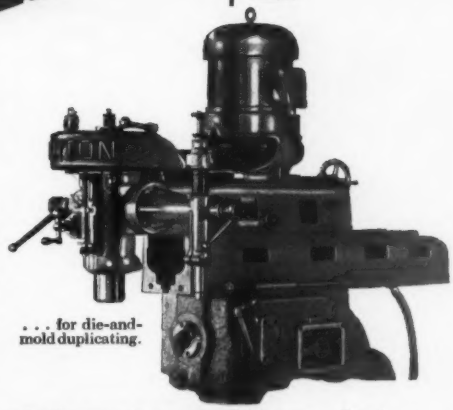
HORIZONTAL MILL

VERTICAL MILL (Super-speed)

DUPLICATOR (Simply add a duplicator head and a duplicator table.)

NOTE: You can switch from horizontal to vertical high-speed milling in 5 minutes or less. Save space and capital equipment — and increase production facilities at the same time.

Gorton Exclusives . . . Yours in the 2-28



. . . for die-and-mold duplicating.

- **Fullwidth knee, 24½ inches wide, provides extreme rigidity. Even under heavy cutting loads, there's no sag or twist.**
- **New lubrication system dissipates heat to prevent spindle "growth" . . . to promote full use of spindle horsepower . . . to end the necessity for adjusting cutter depth to compensate for differences between "hot" and "cold" operation.**
- **High-speed head delivers spindle speeds up to 4000 rpm. Horizontal spindle: up to 2000 rpm — 7½, 10 or 10/5 hp *at spindle nose.***
- **Double-extension feature of the Receptor Ram greatly increases work area, vertical capacity and transverse cutting capacity on either the Gorton 2-28 or 3-34 Horizontals.**
- **Down time and maintenance are drastically reduced by *true* unit construction features. A removable coolant pan speeds sump cleaning and coolant changing.**
- **Overload protection automatically safeguards expensive cutters. A horsepower-load meter constantly indicates cutter condition and operating efficiency.**
- **Full directional front and rear controls are interlocked.**

You can't afford to overlook this Gorton Horizontal with Receptor Ram. It could produce more profit per dollar invested than any other machine you have. Fill out and mail the coupon.

GEORGE GORTON MACHINE CO.

1208 Racine St., Racine, Wis., U.S.A.

Please send at once Bulletin 1655-1208 and data on Gorton Horizontals.

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Title .....

Address .....

City, State .....

A 7788-⅔

CIRCLE INFORM-A-GRAM KEY NO. 83

you can sharpen

4,800

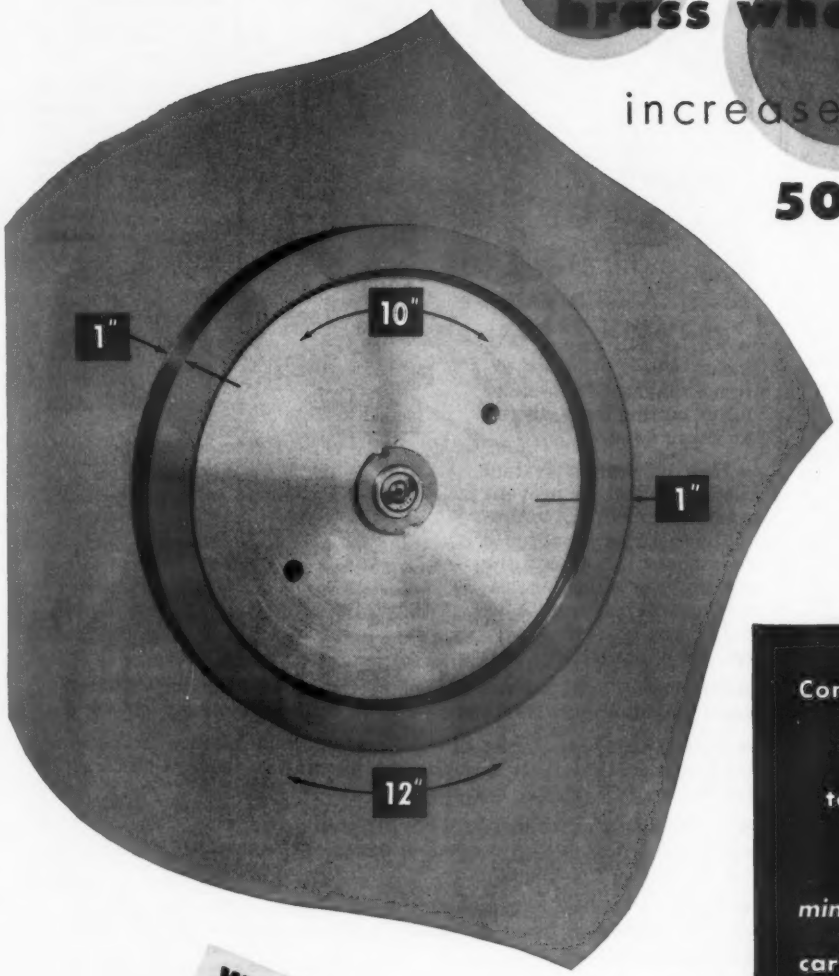
½ x ½ tungsten carbide

insert tools with this $45

brass wheel and

increase tool life

50 to 200%



Ave. cost per tool sharpened:

.009¢

Convert from abrasive and diamond wheels to an Elox brass wheel and save 50 *minutes* sharpening 20 carbide insert tools.

WE CAN SHOW YOU HOW!

elox *corporation of michigan*

734 north rochester road • clawson, michigan

CIRCLE INFORM-A-GRAM KEY NO. 84

AUTOMATION OF MEASURING

American participation in a conference on the "Automation of Measuring" has been asked by the International Mechanical Engineering Congress with headquarters at Paris, and the sponsoring organization the AMMA, Turin, Italy. The conference, or Colloquium at Stresa, (Italy) will be held September 24 and 25, immediately after the closing of the Fourth European Machine Tool Exposition at Milan, Italy, September 13 to 23.

An introductory paper on the theme of the conference has been prepared by Dr. Ing. P. Leinweber, Professor of the Technische Hochschule of West Berlin. This paper, which will be the basis for discussion, deals with the organization and importance of inspection in production, and particularly of automatic inspection. The paper will go to all making advance registration.

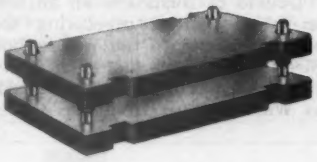
Contributions in the form of questions, prepared papers, or films, covering ideas or experiences in the field of automatic inspection, will be welcomed by the sponsoring organization.

HOLLOW BARS SAVE FABRICATING TIME

Hollow bars of Crucible tool steel are accelerating the fabrication of ring-shaped parts, which traditionally have been cut out of solid bars or special forgings. Manufacturers of stamping dies, cam dies, liners, ring gauges, trim dies and similar products, are typical of those firms that are taking advantage of this new product family. Such parts can be made from hollow bars more economically because the fabricator bypasses the high cost of machining the central areas. Crucible hollow tool steel bars are furnished with a prior machined surface and hole.

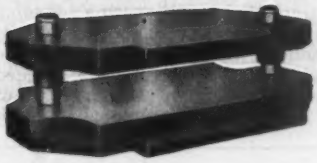
Five grades of tool steel presently available in hollow bar form, and warehouse stocked, cover the normal range of tool and die applications, although other grades are available on mill delivery. Stock sizes of hollow bars range from 2" rd., with a 1" hole, to 16" rd., with a 12" hole.

Specify DETROIT
for any type of die set



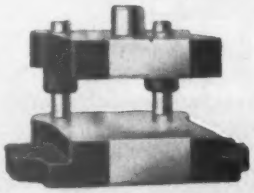
Special ALL-STEEL
DIE SETS

. . . any type or size of die set, factory-built, factory-assembled and factory-tested to meet the most exacting specifications.



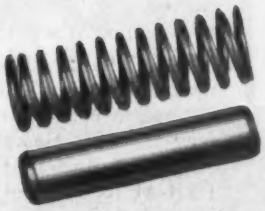
Special SEMI-STEEL
DIE SETS

. . . using premium castings, formulary-controlled for high tensile strength, good machining qualities and exceptionally long life.



Stock PRECISION
& COMMERCIAL SETS

. . . both types available in regular, long narrow and reverse styles in all standard sizes, ready for immediate shipment.



Precision-BUILT
ACCESSORIES

. . . a wide range of high-quality supplies, built to Detroit's precision standards, ready for immediate shipment.

Detroit
DIE SET
CORPORATION

Call "Detroit"

2895 W. GRAND BLVD.
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BUFFALO	CI 0163	INDIANAPOLIS	HU 5604	PHILADELPHIA	VI 4-4084
CHICAGO	PU 5-0500	KANSAS CITY, MO.	VI 3538	PITTSBURGH	LO 1-4011
CINCINNATI	HU 7775	LOS ANGELES	AD 7251	ROCK ISLAND, ILL.	8-2814
CLEVELAND	TO 1-0860	MILWAUKEE	GL 3-7170	ST. LOUIS	FR 1-6810
DALLAS	TE 5029	MINNEAPOLIS	OR 5-7980	SEATTLE	EL 1454
DAYTON	HE 3042	MONTREAL, CAN.	GL 6126	TOLEDO	MA 4510
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DENVER	SH 2451			WASHINGTON, D.C.	AD 4-5700

CIRCLE INFORM-A-GRAM KEY NO. 85

MEN YOU SHOULD KNOW

Three important appointments involving the sales, engineering and production departments of the Super Tool Company, Detroit, have been announced. **Milton J. Steffes,** formerly Sales Manager, has been promoted to Chief Engineer in charge of all design, field engineering development and new product engineering. **Kenneth R. Fisher,** Carbide Tool Field Sales Representative succeeds Mr. Steffes as Sales Manager. **Louis B. Szal** has been promoted to Works Manager. He has been associated with the company since 1937, and will have charge of all production and shop personnel in both the Detroit and Elk Rapids plants.

◆

Donald C. Burnham, an authority on industrial manufacturing techniques, has joined the Westinghouse Electric Corp. as vice president in charge of manufacturing. He comes to Westinghouse from the General Motors Corp., where he has held the positions of manufacturing manager and assistant chief engineer of the Oldsmobile division. Another appointment announced by Westinghouse was that of **Joseph F. Chalupa,** who has been named works manager of the Aviation Gas Turbine Division. Mr. Chalupa will be in charge of all plant operations at the division's South Philadelphia, Pa., plant.

◆

Jacob J. Jaeger has been appointed to the newly created post of Chief Engineer, Machinery Engineering Department of Pratt & Whitney Division, Niles-Bement-Pond Company. Mr. Jaeger joined P & W as a Research Engineer in 1940 and was made Assistant Manager of Machinery Engineering in 1951.

◆

Paul H. Taylor's election as a Director and Vice President in charge of the Research and Hydra Spring Divisions of the Wales-Strippit Corp. of North Tonawanda, N. Y. has been reported. Mr. Taylor joined the company in 1945 and since that time has been Director of Patent and Research.

◆

Frank Pfefferle has become Special Projects manager of The Cincinnati Shaper Co. Other promotions announced at Cincinnati Shaper were **Alfred Baumgartner** to Sales Manager; and **Joseph Warren** to Advertising Manager. Mr. Pfefferle's new duties will involve special work primarily in the fields of new product development and market research.

◆

John H. Nelson has been named works manager of the Chicago plant of the Kropp Forge Co. Mr. Nelson, who formerly was assistant plant manager, joined Kropp Forge in 1948. Prior to that he was vice president in charge of forging production at Harvey Metal Corp., of Chicago.

◆

Raymond B. Kropp, executive vice president and treasurer of the Kropp Forge Co., Chicago, was elected chairman of the board and its chief executive officer at a recent meeting of the board of directors. As chief executive officer Mr. Kropp, who has been with the firm since 1934, will have complete control over the administration of manufacturing operations, inventories and schedules as well as the power to administer all matters relating to finance. He will continue as treasurer of the company.

Cleveland..the BEST* in Precision Gaging

Cleveland electronic gaging equipment offers **unusual advantages** in dimensional inspection and control applications — in gage rooms, tool rooms, and production departments. Here are some of the reasons why:

- Frictionless gage head movement and drift-free amplifier assure CONSISTENT REPEAT READINGS.
- WIDE CHOICE OF SENSITIVITIES — from .0005″ (or more) to .0000005″ per scale division, depending on the equipment selected.
- VERSATILE. Checks concentricity, runout, roundness, taper, size. Used for automatic gaging and sorting; automatic control; machine referencing; recording of measurements. Readily used with special fixtures. Standard models include the INDI-AC electronic indicator; PAR-AC production gage; MICRO-AC microcomparator (reads in millionths — or half-millionths).
- EASY TO READ. Has continuous linear scales over two ranges, used interchangeably at will; widely-spaced scale divisions; fast meter response, without overshoot.
- PRACTICAL. Has fast, easy setup; fast warmup; low contact pressure. Rugged; portable; built for shop use. No special skill required.

FREE BULLETIN 542 gives full details — describes the equipment and how it works — shows shop, tool room and gage room applications of many kinds. Write for it! You'll be interested, and may find it a bit of an eye-opener.

*BEST? Ask the USERS listed in the bulletin — or any others. Names on request.

Designed, developed and manufactured by

Cleveland INSTRUMENT CO.
735-3 CARNEGIE AVE. CLEVELAND 15, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 86

MEN YOU SHOULD KNOW

W. Curtis Miller and **Leland E. Coulter** were appointed vice presidents of the Allied Products Corp. Also, **V. Leonard Hanna** was selected to the newly created office of controller.

◆

Peter J. Jensen has been named Manager of Manufacturing at Carboloy Department of General Electric Company. He joined Carboloy as a tool engineer in 1937 and until recently had been manager of the firm's Michigan sales district.

◆

The Brown & Sharpe Company of Providence, R. I., has announced the formation of three additional divisions in its manufacturing organization. **Dean Hunter,** formerly Works Superintendent, was named Division Superintendent of the Screw Machine Division. **Frank E. Manchester** was made Division Superintendent of a Central Services Division, uniting many of the company's important service departments. **Frank A. Benoit, Jr.,** was named Division Superintendent of the Foundry Division, which includes the company's iron casting, cleaning and pattern making facilities.

◆

Jerome Sullivan, Secretary-Treasurer of the Michigan Drill Head Company of Hazel Park, Mich., was elected President of the Board of Directors at a recent meeting. Also at the meeting, **James F. Burkett** was reelected Vice President and in addition was named Secretary and **John H. Verlinden,** formerly Secretary-Treasurer of Plywood, Inc., was named Treasurer.

◆

Organization changes at The Timken Roller Bearing Company of Canton, Ohio have resulted in promotions for three men. **Herchel M. Richey,** Factory Manager of the Bearing and Rock Bit Divisions, has been named General Factory Manager. **Henry A. Tobey,** General Superintendent of the Canton Bearing Division, has been promoted to Factory Manager of the Canton and Gambrinus bearing factories, and **Wilbur L. Young,** Assistant Chief Inspector, has been named General Superintendent of the Canton Bearing Division.

◆

William D. Reed, former superintendent of fabrication at the Convair Division of General Dynamics Corp., San Diego, Calif., has been appointed works manager of the Midwest Division of H & B American Machine Co., Inc., of Indianapolis. Mr. Reed joined Convair at San Diego in 1941 as an assemhbly mechanic. During World War II, he was assistant general foreman in charge of the B-24 Liberator bomber final assembly line He later became general foreman of the experimental factory, and for the past three years has been superintendent of fabrication.

Dr. Carl B. Post has been appointed Head of the Metallurgical and Research Departments of the Carpenter Steel Company of Reading, Pa. Carpenter Steel also announces the retirement of **George V. Luerssen,** vice president in charge of Metallurgy, after 47 years of service with the firm. Dr. Post has been chief metallurgist of the company since 1951 and a member of the metallurgical staff since 1938.

A NEW CONCEPT!

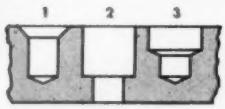
MOHAWK

Size-Optional

SUBLAND

Believing that there is too great a void between standard and special tooling, Mohawk has designed and developed a semi-standard subland tool.

The Mohawk Size-Optional Subland is machined, hardened and placed in a stock bin. This results in a material saving to the customer in set-up costs, reduces delivery time to a fraction of that usually required for special tools, and allows a tremendous reduction in inventory. In ordering these Size-Optional Sublands, the customer is limited only in relation to shank specifications, and partially on overall length requirements. Diameters and step lengths are completely optional to fit the particular application. Write for full details.



SUBLAND DRILL (2-2)
(1) Drill—Chamfer
(2) Drill—Counterbore
(3) Drill—Drill

Mohawk TOOLS, Inc.
910 E. MAIN ST., MONTPELIER, OHIO

worlds largest producer of Sublands

CIRCLE INFORM-A-GRAM KEY NO. 87

Machine Tool Leveling Simplified

Machine shop superintendents and plant engineers will be interested in a new method of leveling machine tools. Using the cored holes in the base of the machine, stainless steel wire thread inserts are installed to provide strong, non-corrosive, permanent threads for the bolts by which the machine is leveled. Shims are eliminated entirely.

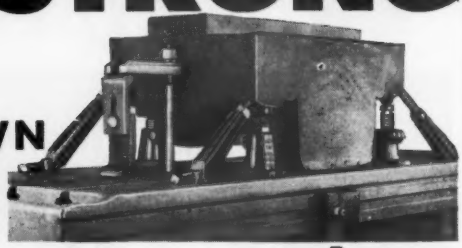
The machine can be moved and quickly releveled as many times as required by changes in production sequence, machine overhaul, or plant moves. The leveling bolts do not corrode and freeze in the holes because the stainless steel inserts protect against corrosion.

Drilling is unnecessary because the holes are cored during casting in dimensions commensurate with the size of the machine. The holes in the machine illustrated are ¾" diameter. The first step is tapping the four cored holes, as shown. The circled inset shows the next step, the Heli-Coil wire insert, ¾-16NF, 1½" long, being installed. Bolts about 2" to 3" longer than the machine base thickness are used. These bolts, on which the threads of the bottom half have been machined off, are screwed down until the machine is level. A lock nut under the head of the bolt is tightened as the final step.

Photo courtesy of Heli-Coil Corp.

ARMSTRONG

SET-UP and HOLD-DOWN TOOLS



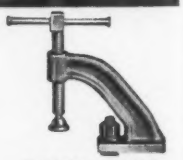
PLANER JACKS

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

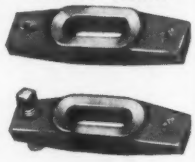
Write for Circular

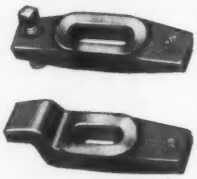
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5220 W. Armstrong Ave., Chicago 30, U. S. A.

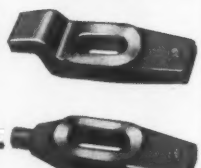


T-SLOT CLAMP

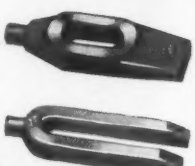
NON-SKID JACKS



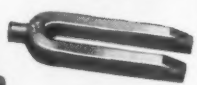


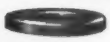


STEP BLOCK



UNIVERSAL CLAMP





T-SLOT BOLTS AND NUTS

STRAP CLAMPS

CIRCLE INFORM-A-GRAM KEY NO. 88

New Furnaces To Speed Bearing Production

A. L. Bergstrom, Vice President in charge of engineering at The Timken Roller Bearing Company, has announced plans to install six new furnaces costing $360,000 and auxiliary equipment in the Timken Company's Bucyrus plant.

The new furnaces, scheduled for installation by December 1, 1954, will carburize, harden and temper bearing parts at a capacity rate of 4,300 pieces per hour. Purchased from, and installed by, the Surface Combustion Company, the new furnaces will process bearing parts from five bearing cone production lines.

Already on order and scheduled for installation by December 1 are 16 automatic screw machines. The new screw machines will also be a part of the new cone production line. A total of over $3,500,000 has been spent, and will be spent, within the next six months in the company's expansion program at Bucyrus.

The appointment of **Clifford T. Olsen** as service engineer has been announced by the Acheson Colloids Company of Port Huron, Mich. A veteran of the U. S. Navy, Olsen was graduated from Lafayette College in 1950 with a B.S. degree in Metallurgical Engineering. Prior to his association with Acheson, he was employed by Hanson-Van Winkle-Munning Co., and Automotive Rubber Co., as electro-chemist and sales engineer, respectively.

Clifford T. Olsen

◆

Appointment of **Leon Marmon** as Sales Engineer for the Parker Appliance Company in the Cleveland area has been announced.

◆

The Sandmeyer Steel Company of Philadelphia has announced the addition of **Harold Weinland** to its sales staff.

◆

A shift in territorial assignments has moved **Robert Yocum,** who had been representing the Clearing Machine Corp. in the Indianapolis territory, to Lansing, Mich. Also, **Jack Weber,** who until recently worked out of the Chicago sales office, has been put in charge of press sales in the Indianapolis region.

◆

Lamson Mobilift Corp., Portland, Oregon, manufacturers of fork lift trucks, announces the appointment of **Floyd M. Mayse** as Southeastern district manager, with headquarters in Atlanta, Ga. In addition to his duties of coordinating all sales and service efforts in the Southeastern United States, he will act as liaison, in the Atlanta area, between Lamson Mobilift and its sister company, the Lamson Corp.

Four Midwest district and branch managers have been appointed by The Carpenter Steel Co., Reading, Pa. They are: **William J. Ervin,** Indianapolis territory; **Paul Holtz,** assistant Chicago district manager who assumes the additional responsibilities for sales and service in the St. Louis, Mo. area: **William J. Stephens,** advanced from assistant manager to branch manager of Carpenter's St. Louis Mill Branch warehouse; and **William C. Kunkelman,** named Southeastern manager in charge of sales and service in the Atlanta, Cincinnati and Dayton territories with headquarters in Cincinnati.

◆

Robert A. Reese has been assigned by the Standard Pressed Steel Co., Jenkintown, Pa., to sales in the New York State territory. Mr. Reese has been with the fastener and shop equipment firm since 1948 and once was in charge of its market research and sales analysis.

FRAY TOP SLIDES
DOUBLE MILLING RANGE
Fray NO. 10RH MILLING MACHINE
UNIVERSAL RAM • TURRET TYPE
A Fray pays bigger production dividends by performing an unequalled range of milling operations. Both of the top slides on the Fray 10 RH are easily adjustable. This feature permits alignment of the turret slide with the table, thus doubling longitudinal and cross milling range . . . or you can just as simply set the turret at an angle to the table and mill in two directions. Combined, the turret slide and table slide provide 38" of overall travel, while the table cross slide, plus the ram slide permits a full 18" of in-and-out adjustment. This equals the overall range of much larger machines. Fray moves precision work faster at less cost.
Fray "All-Angle" Head TYPE 4
For deep, heavy cuts. Permits working to extra close limits. Any angle up to compound 2-way. Request Bulletin 4
Overall Height 7 Feet
Write for details and specifications . . . Request Bulletin # 10
All-Angle
FRAY MACHINE TOOL CO.
2935 NO. ONTARIO STREET, BURBANK, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 89

. . . Die Models, from page 83

substituting mahogany veneer for the plain mahogany board normally used for die models and patterns.

The mahogany veneer is impregnated with phenolic resin and laminated into board. The treatment greatly reduces swelling, shrinking, and moisture absorption in the wood, and increases its resistance to heat.

Ordinary wooden die models and patterns often swell or shrink so much between the time they are built and the time they are used that they require resurfacing. This not only is costly, but may result in loss of production by disrupting the precise timetable required for developing and manufacturing present-day automobiles.

"Since the wooden models determine the shape of the steel dies," Earle S. MacPherson, Ford vice president-engineering, said, "it is important that these models do not change dimensions from the time they are built until the steel dies have been copied from them. This period may vary from a few months to nearly a year."

"Because the processed wood, unlike the plain board, is only slightly affected by changes in temperature and humidity, much costly reworking of die models will be eliminated."

When exposed to various moisture conditions, the die models made from mahogany impreg changed in dimensions only about one-third as much as the die models made from the untreated mahogany lumber. Additional tests made on the impreg panels showed that it is highly resistant to heat, is readily carvable, and can be glued with but slight modification of the present methods used in gluing untreated wood.

Ford has already made die models and patterns for precision molded castings from the mahogany impreg, and have used them successfully in experimental production.

The program conducted by Ford and the Forest Products Laboratory was revealed in a paper presented at the recent Eighth National Meeting of the Forest Products Research Society held at Grand Rapids, Michigan.

T-J toughness
means more work between grinds...
LOWER DIE COSTS!
This T-J Cutter at work on a connecting-rod die block for a board drop hammer. Material being milled is "Hardtem" die steel. A cutter of rigid design and heat treatment for this high speed work in tough die steels, making possible maximum efficiency of these machines.
LARGEST SELLING CUTTERS FOR TOUGH DIE STEEL
Be sure of top performance in die sinking milling cutters . . . specify T-J! They're preferred everywhere today in die and forge shops . . . because T-J Cutters are extra sturdy . . . you can raise the feed!
Designed for speed, accuracy and long life . . . hold a sharp edge longer on job after job . . . less breakage! Made from an extremely high grade steel . . . properly machined . . . scientifically heat-treated and accurately ground. Wide range of styles and sizes to reduce your die costs. Send for new catalog 4-153. The Tomkins-Johnson Co., Jackson, Mich.
FOR TOUGH JOBS SPECIFY
T-J TOMKINS-JOHNSON
38 YEARS EXPERIENCE
CIRCLE INFORM-A-GRAM KEY NO. 90

Movie Tells The Miniature Bearing Story

"Mighty Miniatures," a new 15-minute, 16-mm, sound film in full color offers practical assistance to the engineer and instrument designer.

The film describes the manufacture and inspection of miniature bearings and their application in precision mechanisms. It shows in detail how bearing rings are machined and polished, and how the completed assembly is tested for concentricity, torque, ring diameter, and other dimensions and characteristics. A section of the film is also devoted to the manufacturer's quality control program and packaging methods.

The film is available for showing before technical societies and engineering groups. It may be obtained by writing to the Engineering Department, Miniature Precision Bearings, Inc., Keene, N. H.

Gage Inventory Reduced With Adjustable Gages

A total gaging range from 0.708" to 2.835" is now possible with just six adjustable "Go" and "No Go" gages. They can be set quickly with micrometer,

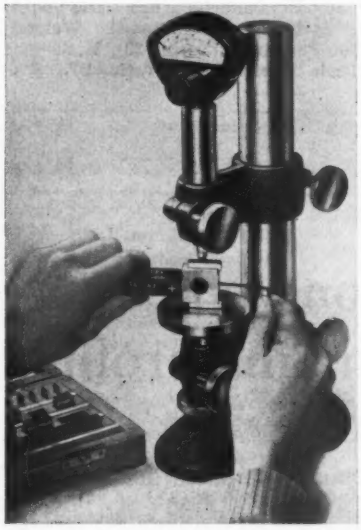


Photo courtesy of Ardec, Inc.

indicator or Johansson block, depending on accuracy required.

Each gage has long jaws similar to solid "Go" and "No Go" plug gages to permit straight entering. Blind holes can be measured to their full depth as easily as through holes.

After being set, the gage can be locked and wax-sealed to prevent tampering. These instruments are ideal for production, quality control, inspection, and for measuring single boring operations, replacing telescope gage and micrometer.

More Versatility for Air-Hydraulic Drill Units

A broadened spindle speed range and flexibility can now be obtained on standard air-hydraulic drill units, by use of a newly developed V-belt drive arrangement.

The new accessory package includes cast iron pulley guards and a motor plate which accommodates standard NEMA rigid-mounted motors. This drive arrangement brings the unit into complete compliance with JIC specifications.

The basic units already featured complete adjustment and range of feed rate, distance of rapid approach, and final depth or spindle travel. Using 4-step dynamically balanced pulleys, the new accessory provides the additional advantage of 24 different spindle speeds. With an 1,800 rpm motor, the spindle range is 590 to 5,000 rpm; with a

Photo courtesy Rockwell Mfg. Co.

3,450 rpm motor, the spindle range is 1,180 to 10,000 rpm.

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FIXTURE CLAMPS and COMPONENTS
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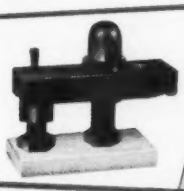
- We stand behind every product we manufacture.
- We assure IMMEDIATE delivery.
- We save you Tool and Design costs.

We feel "QUALITY and SERVICE" comes first, a policy which has made us leaders in our field.



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2421 Walcott St., Detroit 20, Mich.

For our Catalog covering our complete line with full size templates of each product for starting. Morton products can be adapted to specified schemes.

CIRCLE INFORM-A-GRAM KEY NO. 91

Keep Informed • CATALOGS BULLETINS • SPECIFICATIONS

PUBLICATION

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

Fixture Clamps. Over 50 fixture clamps in various styles and sizes are featured in Catalog No. 8 offered by the Siewek Tool Co., 2862 E. Grand Blvd., Detroit 2, Mich.
Circle Inform-A-Gram No. B1.

Micrometers. A new illustrated bulletin giving complete specifications on a line of micrometers imported from England has been issued by the DeWitt Equipment Corp., 136 Lafayette St., New York 13, N. Y. Included are precision micrometers, screw pitch micrometers, adjustable micrometers and accessories.
Circle Inform-A-Gram No. B2.

Precision Quality Piercing Punches, in premium steel—both water hardening and high speed, are the subject of an illustrated catalog offered by the Accurate Bushing Co., Garwood, N. J. The types of punches covered are round, oblong, and square in both the head and headless series.
Circle Inform-A-Gram No. B3.

"The Art of Generating with a Reciprocating Tool" is an illustrated booklet relating applications and basic principles of the reciprocating cutting tool. Of particular interest is a section of this booklet dealing with the production of gears, splines, cams and other shapes. The publication is available from The Fellows Gear Shaper Co., Springfield, Vt.
Circle Inform-A-Gram No. B4.

A Powdered Alloy Steel Guide Pin Bushing is permanently self-oiling, does not bind or gall, and greatly extends guide pin life. This new guide pin is described along with interchangeable punches and dies; Flex-Mount retainers; clinch nuts; and heavy duty punches, in literature available from the Richard Brothers Punch Div., Allied Products Corp., 1560 E. Milwaukee Ave., Detroit 11, Mich.
Circle Inform-A-Gram No. B5.

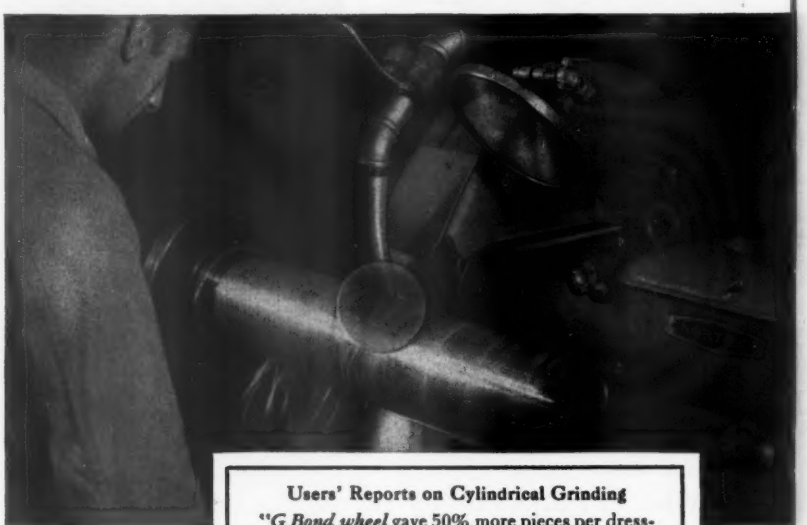
Precision Chucking Machines for multiple cuts to be held concentric, using one setting, are illustrated and described in Bulletin HC-HCT put out by Hardinge Brothers, Inc., Elmira, N.Y. By reviewing this publication, you can see for yourself the high speed, accuracy and ease of operation associated with these machines.
Circle Inform-A-Gram No. B6.

Dual-Wedg Lock. Complete specifications, applications and range of sizes available make up the contents of a folder on the new Dual-Wedg Lock. This holding device offers many advantages in locking cutter blades, tool bits, etc., in cutter bodies, toolholders and broaches. The booklet is being offered by the Wesson Co., Ferndale (Detroit 20), Mich.
Circle Inform-A-Gram No. B7.

More proof of how

Norton G Bond wheels boost O.D. grinding profits

Users praise "TOUCH of GOLD" performance that steps up production rate and quality while cutting costs



Cylindrical Grinding is faster, easier, more profitable when wheels made with the Norton G Bond — most efficient vitrified bond ever developed — add the "Touch of Gold."

Users' Reports on Cylindrical Grinding

"***G Bond wheel*** gave 50% more pieces per dressing, with greatly improved finish."

"***Grinding to .001"*** limits, G Bond wheels removed stock faster, more uniformly. Gave more pieces per dress, with less spark-out time."

"***Cooler cutting***, crush-trues nicely, holds form. Best wheel ever used."

"***Ground sixty .075"*** radius grooves per dressing, compared to 25 with previous wheel. This G Bond wheel, also used on critical shoulder job, held form and gave superior finish."

CIRCLE INFORM-A-GRAM KEY NO. 92

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

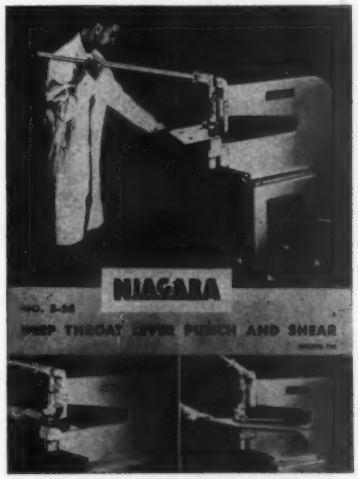
Threading Tools are illustrated and described in Catalog No. 25 issued by Royco Tool Co., Inc., North Branch, Mich. Included in the brochure are illustrations, specifications, dimensions and prices. The booklet also contains valuable information on tapping such metals as steel, aluminum, brass, bronze, cast iron and plastic.
Circle Inform-A-Gram No. B8.

Air Control Valves. Four-way and three-way solenoid operated air control valves, and manually operated pilot valves, are illustrated and described in a bulletin available from the Automatic Valve Co., 37415 Grand River Ave., Farmington, Mich. The brochure includes dimensional drawings and specifications.
Circle Inform-A-Gram No. B9.

Face Milling Cutters and shell end mills in two new series have been added to the Kroslok line made by the Motch & Merryweather Co., Cutting Tool Mfg. Division, 1250 E. 222nd St., Cleveland 17, Ohio. Standard cutters in both series range in diameter from 3" through 24". Special cutters in diameter over 24" also can be had. Bulletin No. 101-Ct illustrates and describes these products.
Circle Inform-A-Gram No. B10.

"Balance—Final Dimension of Precision." is a brochure which discusses the relationship between vibration phenomena and precision manufacturing. This booklet also illustrates the advantages of IRD vibration analysis equipment in seeking out and eliminating unwanted vibration wherever it occurs. Detailed description of the basic model vibration analyzer, and a resume of other equipment in the IRD line are included in the brochure. Copies are available from the International Research & Development Corp., 168 E. Hossack St., Columbus 7, Ohio.
Circle Inform-A-Gram No. B11.

Lever Punch & Shear. A new bulletin (79-B) concisely and fully describes the new Niagara No. 5-24, deep-throat, hand lever punch and shear. Action photos demonstrate the versatility of the machine in performing diverse punching, notching



and shearing operations. Complete specifications for the unit, as well as for extra shearing and punching equipment available, are included. The booklet can be obtained from the Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.
Circle Inform-A-Gram No. B12.

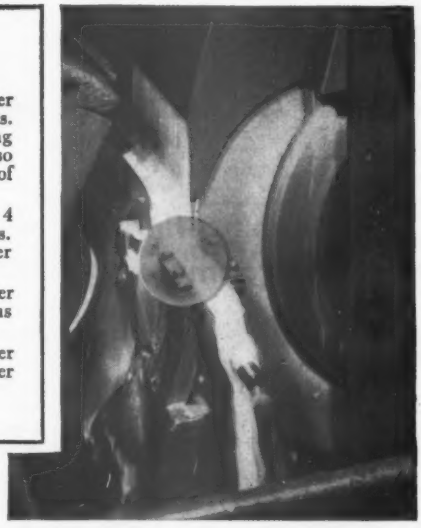
Users' Reports on Centerless Grinding

"*G Bond wheels* produced better form and finish than any other wheels. Gave 50% more pieces per dressing on both rough and finish grinds. Also eliminated previous distortion of work due to overheating."

"*Dressing required* only once every 4 hours, instead of every 40 minutes. Best general purpose wheel ever used on our centerless machines."

"*Cut faster and freer,* held size better and gave better finish than previous standard wheel."

"*G Bond wheel* gave 16 hours longer wheel life and produced much better finish."



Centerless Grinding benefits by the G Bond's unique ability to hold each abrasive grain just long enough for maximum cutting action — an important "Touch of Gold" advantage.

New users are quick to recognize these advantages of G Bond wheels for O.D. grinding:

Cooler cutting action . . . faster stock removal . . . better finish . . . more pieces per dressing . . . longer wheel life . . . easier dressing, with less wear on diamond or on roll.

Added up, all these advantages mean valuable production economies and improvements in your product. That's why G Bond users have been glad to show their appreciation — with a steady stream of endorsements like those shown here.

Your Norton Distributor

is ready with proof of how G Bond wheels can add the work-speeding, profit-increasing "Touch of Gold" to your own cylindrical or centerless grinding jobs. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified 'phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

W-1576

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NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

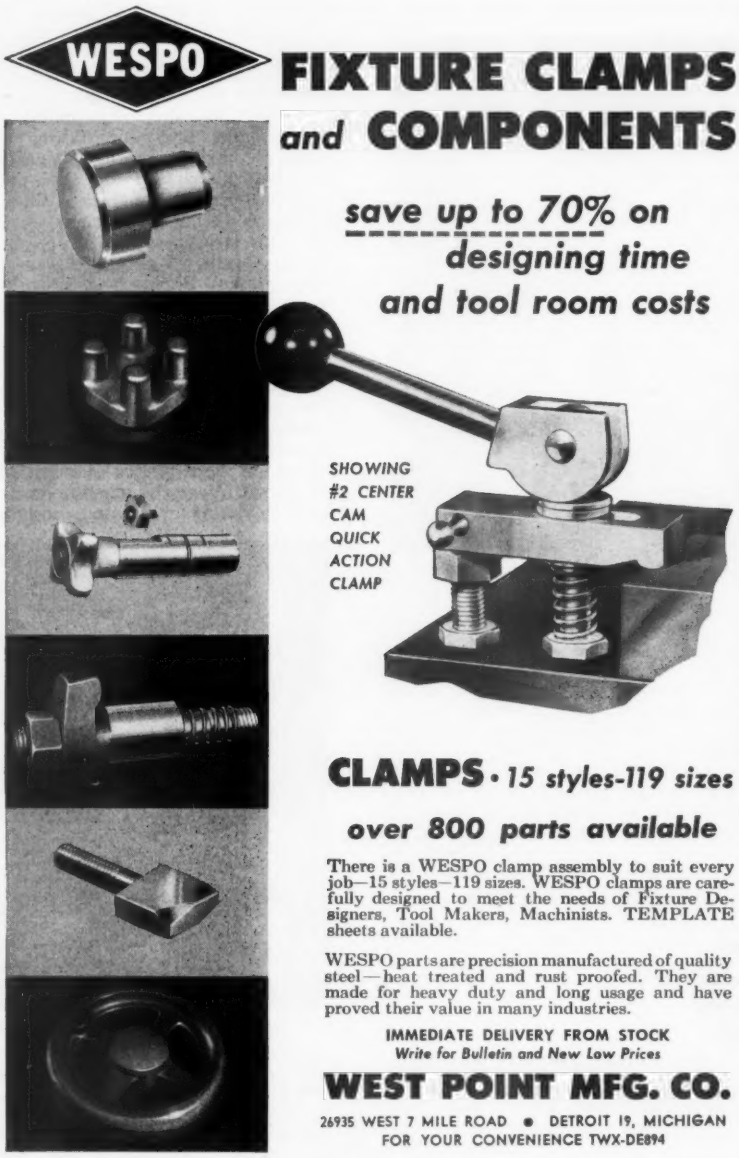
CIRCLE INFORM-A-GRAM KEY NO. 92

Lubricant Application Devices, such as grease fittings, grease guns, and accessories, are illustrated and described in Catalog 91, which is available from the Lincoln Engineering Co., 5701 Natural Bridge Ave., St. Louis 20, Mo.
Circle Inform-A-Gram No. B13.

Everede Quills give faster, lower-cost precision production from multiple-step and special boring bars. They also are quick and easy to insert. Read all about these quills in an interesting catalog available from the Everede Tool Co., 2000 Parkside Ave., Chicago 39, Ill.
Circle Inform-A-Gram No. B14.

"How to Save Money on Industrial, Marine and Railroad Equipment Operation" is the theme of a booklet on lubricants which is made available by the Standard Oil Co. of California, Bush St., San Francisco 20, Calif.
Circle Inform-A-Gram No. B15.

Carbide Grinding Burs. A brochure explaining how Ford carbide grinding burs cut production time 75% is available from M. A. Ford, Inc., 732 W. 1 St., Davenport, Ia. These burs effectively grind hardened steel up to 65 Rockwell C.
Circle Inform-A-Gram No. B16.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There is a WESPO clamp assembly to suit every job—15 styles—119 sizes. WESPO clamps are carefully designed to meet the needs of Fixture Designers, Tool Makers, Machinists. TEMPLATE sheets available.
WESPO parts are precision manufactured of quality steel—heat treated and rust proofed. They are made for heavy duty and long usage and have proved their value in many industries.
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CIRCLE INFORM-A-GRAM KEY NO. 94

Materials Handling Equipment such as shoplifters, worklifters and elevating tables and trucks are illustrated and described in Standard Products Bulletin No. 54 published by the Economy Engineering Co., 4511 W. Lake Street, Chicago 24, Ill. The many uses and other pertinent details of the Economy products, such as specifications and dimensions, are included in this brochure.
Circle Inform-A-Gram No. B17.

Comet Valve. It's a small lightning-fast air valve with just one moving part, a balanced spool and direct four-way operation. That is the Comet valve, illustrated and described in Bulletin 308 available from the Ross Operating Valve Co., 104 E. Golden Gate Ave., Detroit 3, Mich. The bulletin contains operational data, standard and optional features, recommended service and installation information.
Circle Inform-A-Gram No. B18.

Industrial Vacuum Pumps. Operation principles and fields of service of industrial vacuum pumps are related in an illustrated brochure put out by the Perfection Mfg. Corp., Minneapolis 13, Minn. Specifications and dimensions are included.
Circle Inform-A-Gram No. B19.

Weldon Tools, such as end mills, angular cutters, T-slot cutters, etc., pass in review in the latest catalog of all stock tools manufactured by the Weldon Tool Co., 3000 Woodhill Rd., Cleveland 4, Ohio. Also included are many illustrated examples of special tools, plus helpful charts and tables.
Circle Inform-A-Gram No. B20.

Set Screws. This 24-page booklet is devoted exclusively to set screws, regular and special. It includes

technical reference data and is available from the Set Screw & Mfg. Co., 158 Main St., Bartlett, Ill. If writing direct to the company, ask for Catalog No. 19.
Circle Inform-A-Gram No. B21.

Variable Pitch Sheaves & special drives are illustrated and described in a bulletin (Form No. 44) available from Speed Selector, Inc., 118-V Noble Court, Cleveland 13, Ohio. Illustrated are a number of typical

applications of speed selector sheaves on various types of machines and power driven equipment. Shown are installations on a punch press, radial saw, tap grinder, aircraft propeller governor test stand, and tap grinder.
Circle Inform-A-Gram No. B22.

Friction Saws. The faster cutting of ferrous metals by friction sawing is featured in Bulletin No. 4200 available from Kling Bros. Engineering Works, 1320 N. Kostner Ave., Chicago, Ill. This booklet relates in detail the latest developments on the horizontal stroke Kling high speed friction saw.
Circle Inform-A-Gram No. B23.

Drill Templates. A completely revised Anchor Bushing Catalog, Third Edition, relates why Anchor Bushing drill templates are more economical to use; how to make sheet metal and laminate plastic drill templates; and the variety of old and new Anchor Bushings available for both template fabricating methods. Also included is an Anchor Bushing size chart. For your copy of this catalog, write to The Hi-Shear Rivet Tool Co., 8924 Bellanca Ave., Los Angeles 45, Calif., or—
Circle Inform-A-Gram No. B24.

Precision Ground Carbide Tools. Through the medium of Catalog No. 554, The Atrax Co., Newington 11, Conn., will take you on a personally conducted tour of its modern plant. Through the pages of this booklet, you will see why Atrax has gained such a fine reputation for its carbide tools. Photographs and illustrations will acquaint you with the men and machines that make up The Atrax Co. The booklet also contains specifications and other data on Atrax carbide tools.
Circle Inform-A-Gram No. B25.

Magnetic Chucks. Several types of magnetic chucks, i.e., swiveling, rotary and universal, are illustrated and described in literature available from the Hanchett Magna-Lock Corp., Big Rapids, Mich.
Circle Inform-A-Gram No. B26.

Compression Riveter. A riveter that features a squeeze instead of a wallop is the subject of a new catalog section (50) offered by the Keller Tool Co., Grand Haven, Mich. The air tool is designed for riveting, forming, punching and other similar operations.
Circle Inform-A-Gram No. B27.

Power Hack Saws. Ten different types of Keller power hack saws are illustrated and described in a bulletin offered by the Sales Service Machine Tool Co., 2363 University Ave., St. Paul 14, Minn.
Circle Inform-A-Gram No. B28.

Tracing Paper Samples are contained in a brochure offered by the B. K. Elliott Co., 126 Sixth St., Pittsburgh 22, Pa. The literature relates the advantages and outstanding features of the Ghost-Proof Ellco-Vel tracing paper manufactured by the company.
Circle Inform-A-Gram No. B29.

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Porter Punches in stock in all principal cities.
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CIRCLE INFORM-A-GRAM KEY NO. 95

Vertical Milling Machine. Outstanding features of the Model VM-I Crowning shield vertical milling machine are described in a bulletin available from the Crowningshield-Harris Co., Greenfield, Mass.
Circle Inform-A-Gram No. B30.

Rectifiers with capacities from 5 to 50,000 amperes, standard and special design, are described in Bulletin B 20-54 put out by Wagner Bros., Inc., 400 Midland Ave., Detroit 3, Mich. The booklet also covers regulators and controls for use in the plating industry.
Circle Inform-A-Gram No. B31.

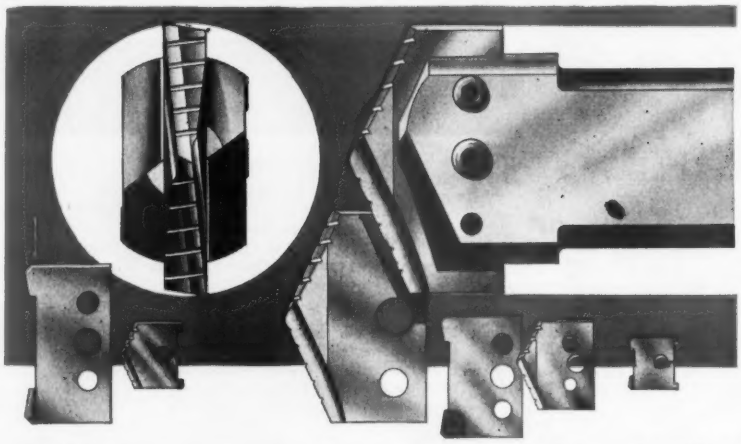
Milling Heads, semi-universal and all-universal, for most sizes and makes of horizontal milling machines are illustrated and described in literature available from the Brown Vertical Head Co., 1615 Riverside Dr., Los Angeles 31, Calif.
Circle Inform-A-Gram No. B32.

Alloy Castings. Heat-resistant and corrosion resistant alloy castings in industry is the theme of the 48-page Bulletin A-141. The booklet is designed for users and potential users of stainless and heat-resistant alloys in cast form. It contains typical compositions regularly produced, with their applications, limitations and the types of service for which they are suitable. Over 175 photographs included. The booklet is available from International Nickel Co., Inc., 67 Wall St., New York 5.
Circle Inform-A-Gram No. B33.

Washer for Transmission Parts. The development of an automatic indexing type, three-stage precision industrial washing machine that cleans 400 automatic transmission castings per hour was recently announced by the International Conveyor and Washer Corp., 652 E. Fort St., Detroit 26, Mich. An illustrated brochure gives complete details of the washer.
Circle Inform-A-Gram No. B34.

Coolant Hose. A new idea in flexible hose is the new "Flex-Set" plastic coolant assembly which bends into and keeps any form until changed by hand. It is free from clogging, corrosion, and leaking and its set position is not altered by vibration or coolant pressure. A recently published "Flex-Set" bulletin is available from Couse & Bolten Co., Plastics Dept., 42 Lafayette St., Newark, N. J.
Circle Inform-A-Gram No. B35.

Precision Lathe. A new, all-purpose, rigidly built precision lathe—with a combination of rugged power and extreme accuracy—is illustrated and described in Bulletin No. S4954, which is offered by Sheldon Machine Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill. Outstanding features of this machine include a large heavy bed, "Zero precision" tapered roller bearings supporting the spindle, and the large 1⅜" hole through the spindle.
Circle Inform-A-Gram No. B36.



Drill Large Holes from the Solid with Interchangeable Spade Drills

Made in 256 cutter sizes, 1 to 5 inch diameter, in steps of 1/64, Conner type Spade Drills drill the required diameter in one operation, need no retracting to clear them of chips. Only eight sizes of holders are needed to handle all cutter sizes.

For general purpose work and in the Tool Room, use the cutter and holder assembly shown above. It is a rugged tool of great rigidity, recommended for large holes of medium depth.

For Production Drilling (for repetitive work), and for the somewhat deeper holes, use Conner type Oil Hole Holders designed for easy coolant flow and fast chip expulsion.

Send for Catalog and Price List

For Boring: Core Drill Cutters, for semi-finishing of cored and drilled holes, are made in the same 256 sizes, to fit the same spade drill holders.

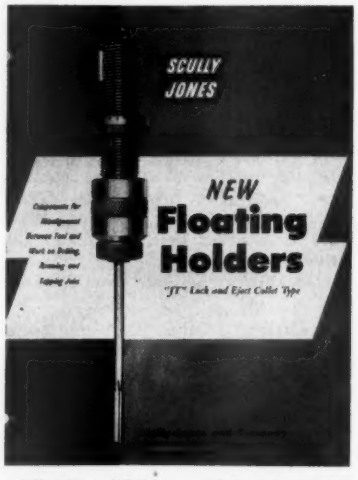
The Gairing Tool Company is now the exclusive manufacturer of the Spade and Core Drills, both standard and special, formerly made by the Conner Tool & Cutter Company.

In Canada: A. C. Wickman (Canada) Ltd., Queensway, Toronto 14

The GAIRING Tool Company

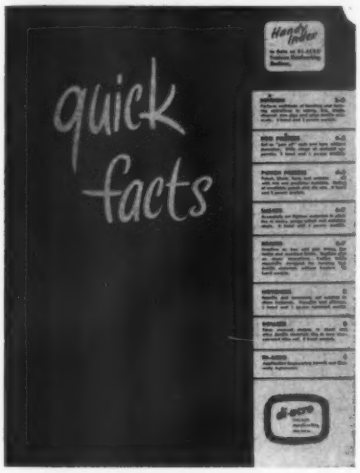
21227 HOOVER ROAD, DETROIT 32, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 96



Floating Holder. This illustrated folder covers a new "JT" lock and eject collet type floating holder. It is available from Scully-Jones and Co., 1901 S. Rockwell St., Chicago.
Circle Inform-A-Gram No. B37.

Duplicating Equipment. Faster, more economical ways to form and fabricate material through the use of Di-Acro precision metalworking machines are described and illustrated in a new booklet available



upon request from O'Neil-Irwin Mfg. Co., 626 Eighth Ave., Lake City, Minn. The brochure gives a concise summary on both hand and power operated Di-Acro benders, brakes, notchers, punch presses, rod parters, rollers and shears. The booklet also explains how parts are economically duplicated to die accuracy without expense and time delay of making special dies. Specifications and capacities on 42 Di-Acro models are listed in easy-to-read table form.
Circle Inform-A-Gram No. B38.

Solenoid Operated Valves. A bulletin telling of the simplicity and versatility of its CV Series electric solenoid valves is available from the Modernair Corp., 400 Preda St., San Leandro, Calif. Illustrations and diagrams help present better pictures of the valves.
Circle Inform-A-Gram No. B39.

Drilling & Tapping Unit. Engineering specifications and full details on the Bellows-Locke drilling and tapping are contained in Bulletin BL-5, a descriptive piece of literature put out by The Bellows Co., 222 W. Market St., Akron, Ohio. This unit features adjustable controlled-air powered rapid advance and retract, with adjustable hydraulically controlled feed rate, with an electrically driven spindle.
Circle Inform-A-Gram No. B40.

Cutting Tools. Here is some of the data which you will find in Catalog No. 60 offered by the Ingersoll Milling Machine Co., Rockford, Ill.: Selecting proper face mills and blade material; descriptions of face mills, solid shank end mills, arbor cutters, helical cutters, boring tools, and special cutters; cutter maintenance; descriptions of the Ingersoll pneumatic cutter, cutter grinder, special Ingersoll milling and boring machines; recommended cutter grinds, machine accessories, table of cutting speeds; feeds and speeds for face milling; and an Ingersoll carbide comparison chart.
Circle Inform-A-Gram No. B41.

Machine Selection Charts. One of the most comprehensive catalogs ever compiled by the Kearney & Trecker Corp., Milwaukee 14, Wis., is now available from the precision and production machine tool manufacturer. The catalog not only lists the company's many milling machines and accessories, but also presents helpful machine selection charts and details on how to use the firm's excellent customer engineering or educational services.
Circle Inform-A-Gram No. B42.

Precision Balancing. Kinds of balance, the condition of unbalance, and precision balancing machines are discussed in a brochure available from the Micro-Poise Engineering & Sales Co., 14851 River Ave., Detroit 27, Mich. This brochure serves as a practical guide to production balancing.
Circle Inform-A-Gram No. B43.

Gaertner OPTICAL INSTRUMENTATION

TOOLMAKERS' MICROSCOPE

READS TO .0001"

DIRECT COORDINATE MEASUREMENT

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THESE LISTED FEATURES MAKE THE TOOLMAKERS' MICROSCOPE AN ALMOST INDISPENSABLE INSTRUMENT IN YOUR SHOP OR LABORATORY.

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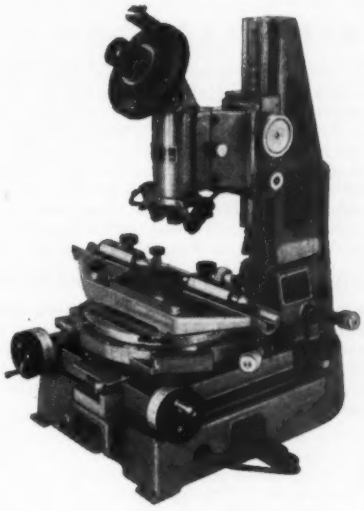
Rang 360°
Reading To 1 Minute

Magnification 30X

Stage Motion
By 2 Inch
Precision Screws

Column Tilt 8°
For Helix Measurement

Rugged Construction
For Dependable
Accurate Service



ACCESSORIES

Templet Ocular Head

Standard Radius And
Thread Form Templets

Camera and Projection
Attachments

Inch or Metric Scales

Magnification From 10X To 100X

For a completely illustrated book listing detailed specifications and accessories request Bulletin 147-50.

THE GAERTNER SCIENTIFIC CORPORATION
1242 Wrightwood Avenue • Chicago 14, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 97

Hydraulic Lifts. Several types of hydraulic lifts are illustrated and described in literature available from the Lee Engineering Co., Pawtucket, R. I.
Circle Inform-A-Gram No. B44.

For AC Welding. A new power source for AC welding is described in literature available from the Lincoln Electric Co., Cleveland 17, Ohio. The source is the "Fleetwelder Special" machine that provides an exceptionally wide current range with a generous reserve for heavy, sustained welding at high currents.
Circle Inform-A-Gram No. B45.

A Mechnical Cleaner that removes 92% of oil moisture and dirt from compressed gas and ail lines is illustrated and described in Catalog 252 which is available from the Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, Ill.
Circle Inform-A-Gram No. B46.

A Quick Connect-Disconnect Hose Coupling for air, water, oil, steam, gas and chemical lines, provides permanent freedom from leakage and is described in a bulletin just published by Industrial Sales, Titeflex, Inc., Hendes St., Springfield 4, Mass.
Circle Inform-A-Gram No. B47.

INCREASE PRODUCTION WITH SAFETY!

A NEW ATTACHMENT FOR PRESSES WITH MECHANICAL CLUTCHES

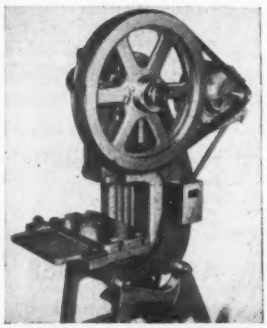
We offer a dual push-button solenoid operated trip attachment that will help increase production. Relieves fatigue with its ease of operation. Two hands must be on the controls when press is tripped. Both buttons must be pushed to trip the press, and both buttons must be released to again trip the press. This prevents an operator from beating the safety attachment by use of rubber bands, sticks, elbows or other means. A reset mechanism is actuated by back contacts of push buttons, requiring definite use of two hands by the operator.

Trip attachments give you these features:

• Dual mushroom type push buttons with reset contacts • 110 volt solenoid housed in aluminum box • Red warning light • Reset relay and micro-switch • Wiring and cord set for plugging into standard electrical outlet • Adjustable connecting links. Foot switch also available.

Junior Package Unit, less table $94.50
Complete with table $114.50

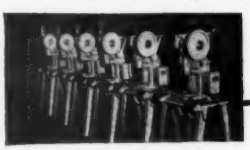
For larger presses up to 20 ton capacity such as the Perkins No. 351B.
Unit less table $125.00
Complete with table $145.00
Units available for heavier presses.



PERKINS No. 351B STANDARD INCLINABLE PRESS

20 ton capacity press equipped with electric solenoid safety trip attachment and work table, complete with motor and control.

f.o.b. Warren, Mass. $1345.00



Junior Presses with dual push button electric solenoid safety trips.

Perkins Machine Co. Warren, Mass.

PRESS BUILDERS FOR OVER 50 YEARS

CIRCLE INFORM-A-GRAM KEY NO. 98

Typical Honing Applications. This new booklet lists 35 benefits that can be realized from honing. It shows the working principle of Sunnen Honing and tells how it differs

from other metalworking methods. Pictures and production data on numerous applications are given. The booklet is available from Sunnen Products Co., 7910 Manchester, St. Louis 17, Mo.
Circle Inform-A-Gram No. B48.

Metal Cut-Off Band Saws. A new catalog describing in detail its new line of metal cut-off band saws is available from the Johnson Mfg. Corp., Albion, Mich. This line has a range of capacities to cut practically anything in the stock rack; Rods, tubes, angles, heavy rounds or flats, and irregular shapes.
Circle Inform-A-Gram No. B49.

Precision Lathes, drill presses, shapers, and pedestal grinders are described in detail in a new General Catalog 5406 offered by South Bend Lathe Works, 425 E. Madison St., South Bend, Ind. Specifications and construction data about South Bend's complete line of standard machine tools are included as are more than 100 illustrations plus numerous sketches.
Circle Inform-A-Gram No. B50.

Metals Research. A colorful brochure summarizing facilities available for metals research has been published. Among other things, the publication outlines the facilities available in the fields of powder metallurgy, applied metallurgy, electro-chemistry, extraction metallurgy, foundry and steelmaking, mechanical metallurgy, non-ferrous metallurgy, physical metallurgy, metallography, and welding. Copies can be obtained from the Metals Research Dept., Armour Research Foundation of Illinois Institute of Technology, 3350 S. Federal St., Chicago 16, Ill.
Circle Inform-A-Gram No. E51.

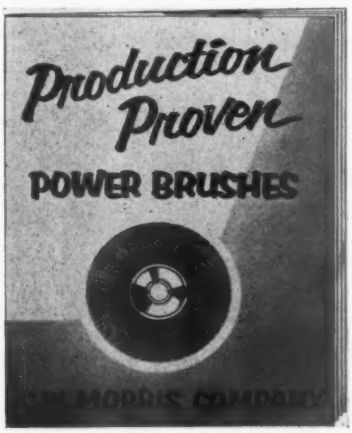
Sharpening Machine. The Barber-Colman No. 10-12 sharpening machine has been designed to accommodate wet grinding of high speed steel and carbide-tipped hobs and form-relieved cutters. Read about the machine in Bulletin No. 6216, now being offered by Barber-Colman Co., Rockford, Ill.
Circle Inform-A-Gram No. B52.

Precision Tools produced by R. B. Tool Co., Inc., 785 N. Broadway, White Plains, N. Y., are illustrated and described in Catalogs No. 104 and No. 105, which are now available. Covered are such products as boring bars, carbide bits, jig boring sets and new cutting off tools with adjustable spring action.
Circle Inform-A-Gram No. B53.

Circular Saw Blades. An informative brochure describing the new radialloy-tipped, super-finished circular saw blades with perfected body and tip for cutting woods, plastics, composition materials and nonferrous metals is available from the Radial Cutter Mfg. Corp., 831 Bond St., Elizabeth, N. J.
Circle Inform-A-Gram No. B54.

Airless Blast Machine. Blast cleaning by airless means in a tumble-type machine is the subject of a new bulletin just published by the American Wheelabrator & Equipment Corp., 1183 S. Byrkit St., Mishawaka, Ind. Describing specifically the 11½ cu. ft. capacity Tumblast model, the booklet also contains descriptive mention of the advantages of the airless blast cleaning process.
Circle Inform-A-Gram No. B55.

Power Brushes. Here are 16 pages of facts, application data and product information on power driven brushes for such work as de-burring,



roughing, stripping, finishing, polishing, grinding, removing rust, scale, corrosion, etc. The catalog is available from the C. W. Morris Co., 10628 Cloverdale, Detroit 14, Mich.
Circle Inform-A-Gram No. B56.

Carbide-Tipped Reamers are the theme of Catalog No. 53 issued by Wendt-Sonis Co., Hannibal, Mo. The booklet also lists many other carbide cutting tools—both single point and multiple point.
Circle Inform-A-Gram No. B57.

Hydraulic Power Units. Single, multiple and hi-lo pump power units are illustrated and described in Bulletin No. 600 available from The Airoyal Co., 6 Church St., New York 6, N. Y. The bulletin includes features of the units, dimensions and specifications.
Circle Inform-A-Gram No. B58.

Flexible Shafts are illustrated and described in literature available from the Binghamton Flexible Shaft Division of the Swartz & White Mfg. Co., Binghamton, N. Y. Application and specification data also included.
Circle Inform-A-Gram No. B59.

The Ion-Exchange System for the purification of chromic acid copper stripping solution is described in detail in Bulletin No. 224-B-454 available from The Industrial Filter & Pump Mfg. Co., 5900 Ogden Ave., Chicago 50, Ill.
Circle Inform-A-Gram No. B60.

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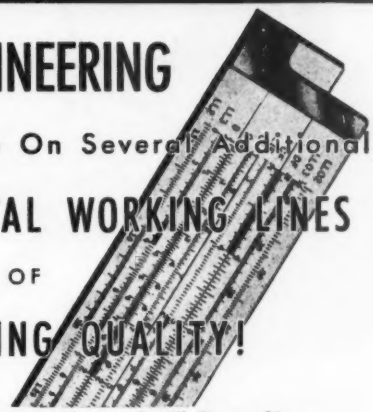
HALLMARK ENGINEERING

Is Prepared To Take On Several Additional

INDUSTRIAL METAL WORKING LINES

OF

OUTSTANDING QUALITY!



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Write, sending literature to:

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CIRCLE INFORM-A-GRAM KEY NO. 99

Precision Built portable electric grinder-millers, power quills, machine tool mounts and accessories are illustrated and described in General Catalog FGH-1 put out by the Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Circle Inform-A-Gram No. B61.

Prolong Drill Life. Elimination of the "human error" in drill grinding is the subject of a new illustrated brochure on the Black Diamond drill grinder. Among other things, the folder (available from Black Diamond Saw & Machine Works, 76 N. Ave., Natick, Mass.) explains how drills can be sharpened and web-thinned with scientifically controlled accuracy, even by the most inexperienced worker.
Circle Inform-A-Gram No. B62.

Jig & Fixture Components. A new 86-page catalog describing and illustrating its recently expanded line of standard jig fixture components has just been issued by Lodding Inc., Dept. N82, 79 Beacon St., Worcester 1, Mass. New products described are plain fixture keys, heavy duty jacks, and ductile iron bar knobs and speed handles.
Circle Inform-A-Gram No. B63.

Quality pays off

SAJO *in operation tells its own story**

"SAJO" and "Quality" are synonymous. The high standards and painstaking Swedish craftsmanship on which the SAJO reputation has been established are faithfully maintained in all SAJO Milling Machines. They are built to assure the accuracy and dependability which mean profitable operation — and their cost is surprisingly low. Available in 3 models!

Model 54 (illustrated) a full No. 2 capacity ALL-GEARED Miller — Plain or Universal types — with 5 HP main drive motor and 1½ HP table feed motor; #50 NMT spindle; 16 spindle speeds up to 1500 RPM; single lever speed and feed selectors with direct reading dials; single lever control for START-STOP-BRAKE; table power feed and POWER RAPID TRAVERSE in 3 directions. Model 53 Light Duty No. 2 ALL-GEARED Miller. Model 48 Light Duty No. 2 Utility Miller.

**Ask for references*

austin industrial corp.
76-X MAMARONECK AVE., WHITE PLAINS, N.Y.
Look for the Austin Seal — your full guarantee of satisfaction.

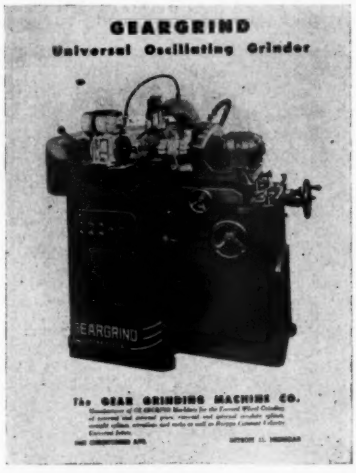
CIRCLE INFORM-A-GRAM KEY NO. 100

An Air Cylinder Catalog containing complete engineering data regarding five different models of automotive air cylinders has just been released by the Petch Mfg. Co., 463 York, Detroit 2, Mich. Size ranges of the cylinders are from 1½" to 6" bore. The cylinders have been designed for heavy duty work in automation — dies, conveyors, foundry, welding equipment, and other automatic machinery.
Circle Inform-A-Gram No. B64.

Broach Sharpeners. A complete line of broach sharpeners for round and flat broaches and universal broach sharpening are described in a new bulletin (#S54) by the Colonial Broach Co., P. O. Box 37, Harper Station, Detroit 13, Mich. The bulletin points out the various design features of the sharpeners and goes into detail on each model in regard to operating procedures, standard and special equipment, and specifications.
Circle Inform-A-Gram No. B65.

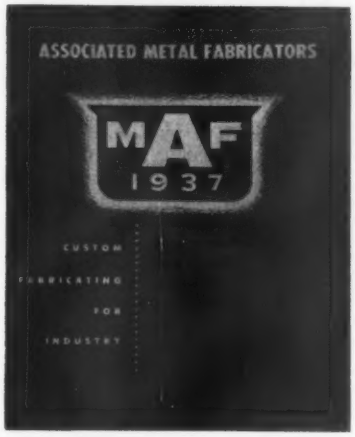
Drum-Type Turret Lathe. Cosa Corp. has released a bulletin on Pittler (German) turret lathe, Model PIROFA 45. The bulletin, with 30 illustrations, plus diagrams of workpieces, describes the Pittler and its many features, including simplified tooling and elimination of cross-slide. The attachments described should be particularly interesting to the optical field and other precision industries. Write to Cosa Corp., Chrysler Bldg., New York 17, N. Y. or—
Circle Inform-A-Gram No. B66.

Oscillating Grinders are illustrated and described in a catalog available from the Gear Grinding Machine



Co., 3901 Christopher, Detroit 11, Mich. The brochure covers the Geargrind universal oscillating grinder for finishing spherical, conical and cylindrical surfaces.
Circle Inform-A-Gram No. B67.

"Custom Fabricating for Industry" is a new brochure visualizing the trend toward mechanized, automatic handling of parts-in-process. It de-



scribes automation and other custom built industrial equipment. The booklet is published by Associated Metal Fabricators, A Division of Jersey Sheet Metal Fabricators, Inc., 18-20 Sebago St., Clifton, N. J.
Circle Inform-A-Gram No. B68.

Bronze Bearings. Data on standard stock bearings, precision bronze bars, electric motor bearings, and graphited oilless bearings is contained in Catalog 52, which is available from the Bunting Brass & Bronze Co., Toledo 1, Ohio.
Circle Inform-A-Gram No. B69.

End Mills. A new bulletin contains descriptions, specifications and prices of a newly developed line of fine-pitched, heavy-duty, inserted carbide blade end mills. The publication is available from the Goddard & Goddard Co., 12280 Burt Rd., Detroit 23, Mich.
Circle Inform-A-Gram No. B70.

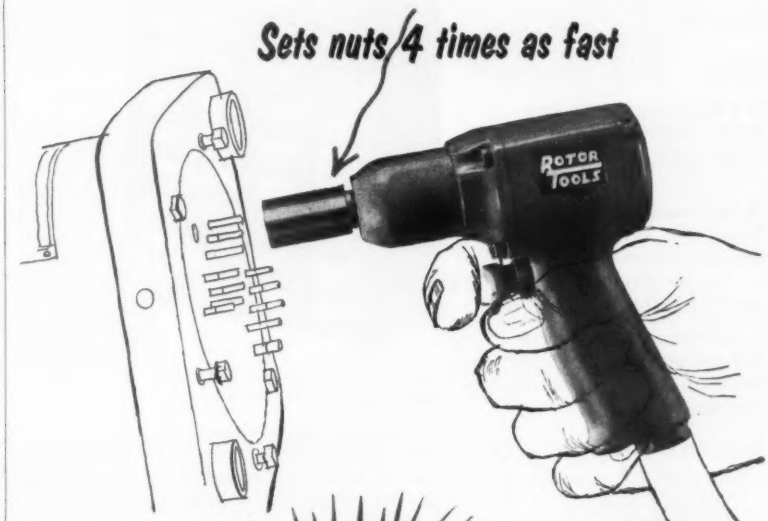
Tool Holders & Accessories. For tool makers, die makers, inspectors, machinists, set up men, machine operators, maintenance and repair men, and automotive mechanics, a brochure on magnetic base tool holders and accessories is being offered by the Cullen Mfg. Co., Racine, Wis. This bulletin (No. 752) covers holders for indicators, inspection lights and safety shields.
Circle Inform-A-Gram No. B71.

Drilling & Tapping Machines. A new, concise Bulletin G54, answering machine tool buyers' and engineers' problems regarding functions and capacities of drilling and tapping machines, has just been released by the Edlund Machinery Co., Cortland 38, N. Y. Included is a chart of the specifications for drilling and tapping machines. The bulletin also contains illustrations of new developments in drilling equipment.
Circle Inform-A-Gram No. B72.

New Precision Collet Holders are featured in Bulletin 200, available from Viking Industries, Box 22, Rockford, Ill. Ideal for Hardinge and other make collets, they can be converted to simple interchangeable tooling for machining small round parts accurately. Two sizes are available—Model 110A for up to 5/8" collets and Model 11B for up to 1" collets.
Circle Inform-A-Gram No. B73.

Try-Out Presses. A new bulletin telling how die try-out presses can substantially reduce die production costs is available from the Dake Engine Co., Grand Haven, Mich. The bulletin (No. 330) describes applications, gives specifications and lists optional equipment.
Circle Inform-A-Gram No. B74.

"Research at ALCOA." Sixty-five years of leadership in light metals research set the theme of this 54-page booklet just published by the Aluminum Company of America 726 Alcoa Bldg., Pittsburg 19, Pa. In addition to a description of the work of Aluminum research laboratories, the booklet provides a useful bibliography of technical articles about aluminum.
Circle Inform-A-Gram No. B75.



NEW ROTOR IMPACT WRENCH
pays for itself in 9 weeks

JOB: Setting hex and socket nuts in gearless drill heads. Tool used only 25% of productive time.
FORMERLY: By hand. Required 2 minutes per head. Often scored finished surface.
NOW: Use new Rotor J-2 Impact Wrenches. Time cut to 0.5 minute.
RESULTS: 4 times as fast. Savings paid for new Rotor Wrenches in 8.7 weeks. Eliminates scoring of surface.
A demonstration in your shop can show how these new Rotor tools can save *you* money! No obligation. Call your nearby Rotor analyst!

Gives you 2100 solid blows per minute to KO your high costs.

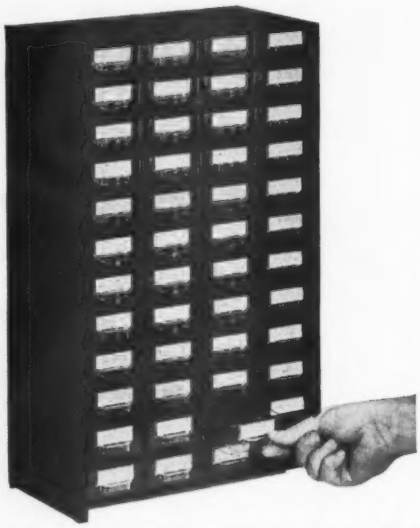
ASK FOR BULLETIN No. 41

CIRCLE INFORM-A-GRAM KEY NO. 101

Plastic DRAWER JIFFY CABINETS

THE BEST WAY TO PUT SMALL ITEMS IN THEIR PLACE!

In every home, in every office, in every shop, there are dozens of small parts requiring easy, convenient storage. The slickest, handiest answer to this problem is the JIFFY Cabinet.



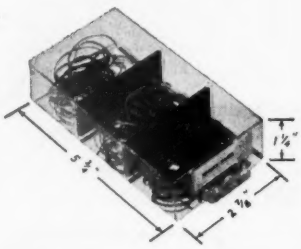
Illustrated — 48-drawer JIFFY Cabinet, red frame with crystal-clear styrene drawers.....only $19.95*

CHECK THESE FEATURES:

• **3 New Color Combinations**
Cocoa Brown with tan drawers.
Black with gray drawers.
Red with crystal-clear drawers.

• **Solid One-piece Back Panels**
Keep dust out . . . maximum strength girder type construction . . . ready-made keyhole slots for handy wall mounting.

• **Rubber-tipped Cabinet Feet**
Prevent scratching . . . increase stability . . . make stacking convenient.



• **Generously Sized Drawers**
More than 18 cubic inches in each one . . . full set of index labels and drawer dividers supplied with every cabinet.

Inside of drawer easily divided into three compartments with metal dividers as illustrated. Each drawer has a stop to prevent accidental spillage and to permit drawer to hang open from back edge. Ribbed runners on bottom of all drawers permit them to slide freely. Index slots on front of drawers allow easy identification of contents.

HANDY PRODUCTS, P. O. BOX 2447, CLEVELAND 12, OHIO

Please send immediately the quantity, size and color JIFFY units as listed:

☐ 48 Drw. @ $19.95* ☐ 32 Drw. @ $12.95* ☐ 24 Drw. @ $9.95* ☐ 16 Drw. @ $7.95*

☐ Red w/clear drwrs. ☐ Black w/gray drwrs. ☐ Brown w/tan drwrs.
(NOTE: If color is not specified, we will ship Red Cabinet w/clear drwrs.)

WE PAY ALL SHIPPING COSTS

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COMPANY.....
STREET.....
CITY.....ZONE... ...STATE.....

Open account shipments on company purchase orders. Otherwise, check with order, please. No C.O.D.'s, please. *Ohio customers add 3% sales tax.

BROWN & SHARPE BETS $5 MILLION ON BUSINESS UPTURN

Stressing a continuing faith in the prospects for its future development, the Brown & Sharpe Manufacturing Co. has announced that it is making "the largest single development and re-equipment appropriation in the company's history".

In a letter sent to stockholders, the company's President, Henry D. Sharpe, Jr., disclosed that the directors of the corporation have now approved an initial capital appropriation of approximately $2,000,000 toward modernization and re-tooling of the company's automatic Screw Machine facility, located at the Providence plant. This, he stated, is in addition to the company's customary capital appropriation for routine replacement and refurbishment, and ranks as 'major surgery" on its production apparatus. The figure announced to stockholders covers capital expenditures only and does not include an estimated $3,000,000 worth of other development costs incident to implementing the program.

"This capital appropriation" said Sharpe "is the first installment on a long-range program designed to keep Brown & Sharpe in its traditional position of world leadership". He indicated that further large-scale capital improvement programs were under consideration for execution during the next few years, after the present phase, expected to last fifteen months, is completed, and sufficient time for further studies has elapsed.

The bulk of the present capital appropriation—larger than the amount spent by Brown & Sharpe for new equipment for its entire plant in 1953—will be used only for the improvement of the machinery in the comnany's existing Screw Machine facility located in its Number 5 Building. Succeeding phases of the plan envision still further remodeling of the layout in the existing facility to afford better floorspace utilization, work flow and reduced manufacturing time.

Sharpe stressed the necessity of doing all things now to prepare for the next upturn in business.

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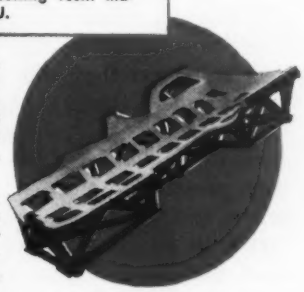

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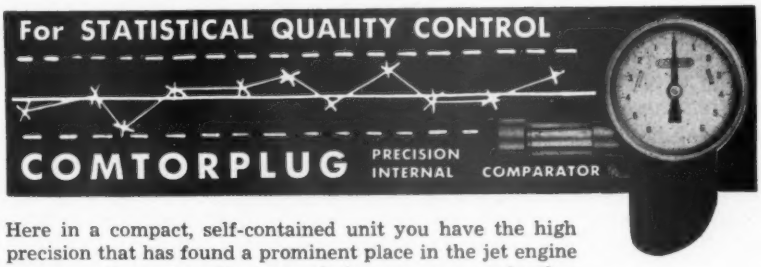

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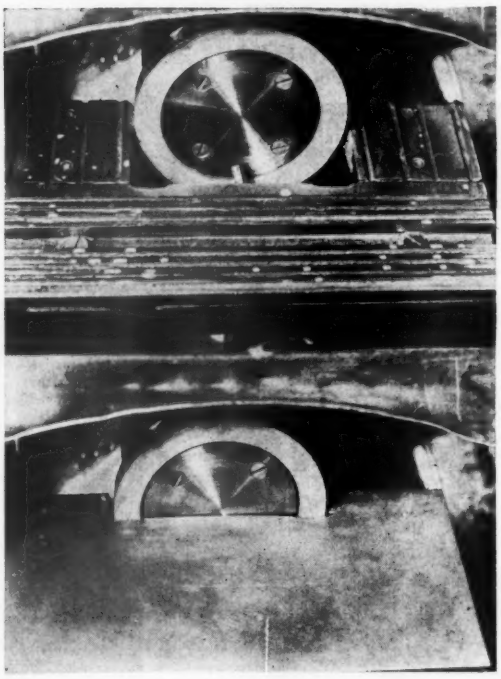
. . . Saftey First, from page 73

One of our safety features is the lack of dust, considering the number of grinding machines in operation. A nozzle at each machine, resembling that of a vacuum cleaner, picks up the dust. These nozzles lead to a master exhaust system that carries off the dust, keeping the air in the section clean and healthful.

At each machine on which there is an exposed grinding wheel, a metal plate, about 2′ x 3′, and of a concave shape, serves as a shield. These shields are painted a light color, to reflect light near the point of operation.

A simple housing encloses each grinding wheel spindle, guarding against "bumping the spindle" accidents. Additional safeguards have been provided for the grinding wheels themselves, so that only the parts with which contact must be made are exposed. A hardened steel plate, conforming to the recess of the abrasive wheel, is attached to it with four screws, 1/32″ below the face of the wheel. A secondary table rest, that fits closely around the abrasive wheel, covers up openings through which a tool might accidentally be dropped.

One of the signs posted in the Tool Grinding Section says "Be Safe, Be Healthy, Be Happy." We think this is a good slogan, and feel that the simple, effective ideas we have adopted, and our close observance of safety rules, have contributed to our outstanding record of safety.



Two steps in making a grinding wheel safer are illustrated in these pictures. First picture shows the use of a hardened steel plate, conforming to the recess of the wheel, to fill up that recess. It is attached with four screws, 1/32-inch below the face of the wheel. The second photograph illustrates the addition of a secondary table rest to fit closely around the wheel, covering holes in the original rest through which a tool might accidentally be dropped.

Maintain Materials At Ideal Machine Feeding Level

One of the most difficult, and often the most dangerous stage of many machining jobs is the manual transfer of material from the waiting stock supply to machine feeding level. This phase of the operation is often time consuming also, with the result that machines so fed inevitably operate at a fraction of capacity.

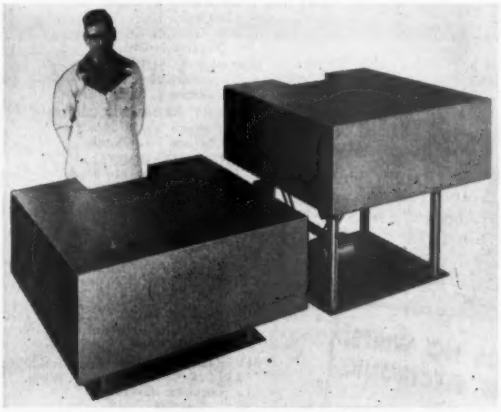


Photo courtesy of Hamilton Tool Co.

Devices for maintaining materials at constant, predetermined levels for convenient feeding of machines are consequently receiving the interested attention of men responsible for production. The "feeding" and "receiving" Portelvator pack lifters illustrated are such devices.

These Portelvators are designed for pit installation. Lift load capacity is 2200 pounds. Rise is 16″ from floor level at a speed of 27.5″ per minute.

Each machine is operated by means of a ¾ H.P. motor with reversing magnetic starter, push button controlled, and each machine is equipped with a gear driven limit switch. An 8″ x 18″ "operator station" is provided on the long side of the 45″ x 48″ table. Apron extends 1″ below floor level when table top is at maximum height.

Power transmission is mechanical, through meshed worm, worm gear, and screw, and neither mechanical failure nor power failure can cause the table to fall or "settle".

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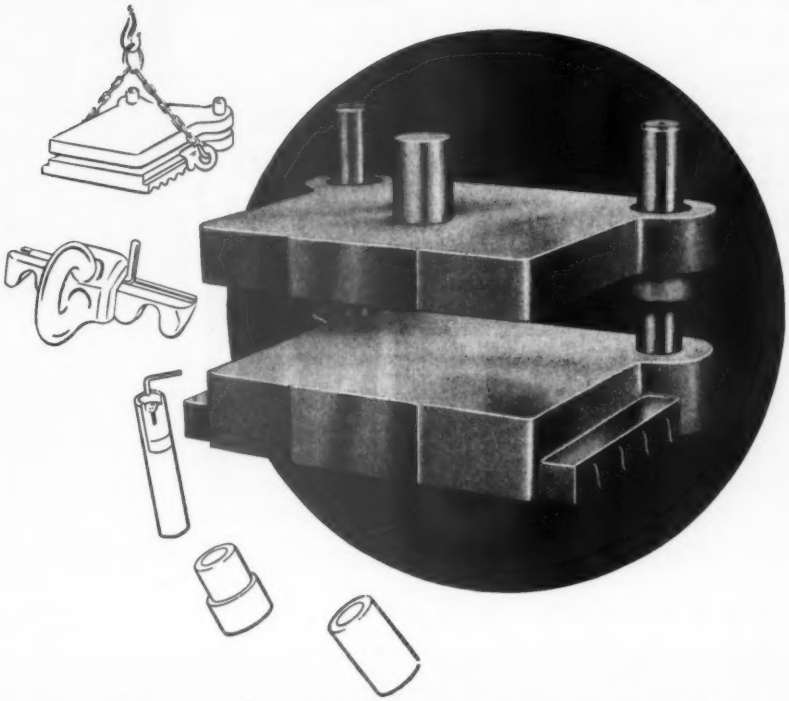

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CIRCLE INFORM-A-GRAM KEY NO. 1041

CLIP-ON NUTS SIMPLIFY MAKING TEMPLATE SETUPS

TEMCO Aircraft Corporation recently began using special Tinnerman clip-on nuts, instead of conventional hex-head nuts and washers, to tighten and adjust template setups at the company's plant in Dallas.

Main advantage of the clip-on Tinnerman nut is that it can be inserted anywhere along the template connecting rod after a series of templates has been strung. Hex-head nuts, on the other hand, must be threaded on from an end of the rod. One man used a drill motor to rotate the threaded rod, pushing it through one template after another in the series. A second man, at the other end of the rod, threaded a nut and washer on the rod before and after it passed through each template.

Use of Tinnerman nuts shortened the time required for setting up templates at no increase in material expense. But template specialists noticed that, after tightening perhaps 30 Tinnerman nuts in a single wing assembly setup, their hands became tender.

It took two hands and considerable pressure to clip a sharp-edged 1" x ⅞" nut onto the rod, and thumbs and forefingers got a further workout threading nuts tight against templates. Progress on setups naturally slowed as hands became more tender. To meet the problem, TEMCO's template specialists developed a Tinnerman nut wrench and an applicator that save hands, and time too.

Both wrench and applicator are made of ½" Parkwood, a composition material against which the nuts don't slip. Both are 4½" long so they can be maneuvered between connecting rods which normally are 5" apart. Both are notched at one end, the notch being the right size to admit and maintain a loose grip on a Tinnerman nut.

The notch on the applicator is grooved slightly so the nut has a more firm seat than it does in the wrench. Now, setup builders simply place a nut in the applicator notch, grip the handle and punch the nut onto the connecting rod.

Once the nut is on the rod, setup builders switch from applicator to wrench, and tighten the nut against the template. The wrench also is used to remove nuts from the rod.

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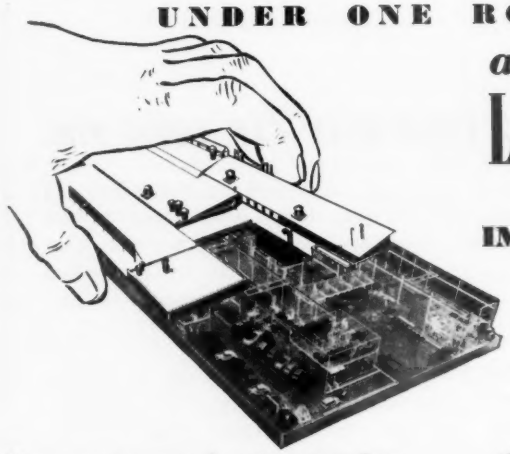

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Engineering Factors to Consider in Planning an Industrial Dust Control System

by W. O. Vedder
Manager
Dust Control Department
PANGBORN CORPORATION
Hagerstown, Maryland

PROPERLY PLANNED and installed dust control systems are a vital part of many modern industrial plants. There are three major reasons for the widespread interest in dust control today. One, because it is a method of improving plant working conditions. Two, it eliminates public nuisances caused by dusts exhausted to the atmosphere. And three, it provides a means of reclaiming useable materials.

All three of these are pressing management problems today. Good working conditions mean higher production and lower employee turn-over; many localities prohibit dust from being exhausted to the surrounding atmosphere; and reclamation helps reduce shortages and salvages valuable materials.

Coupled with the three major reasons for current interest in dust control are four secondary motives. Proper dust control permits recirculation of cleaned air, prevents exhausted dust from re-entering work areas, improves plant housekeeping and decreases building maintenance, and cuts wear and maintenance on operating equipment.

The most widely used means of achieving these benefits of dust control are exhaust systems. These comprise (1) the exhaust hoods and piping system, (2) dust collecting equipment, and (3) the exhauster and its drive. Each component must be considered separately in relation to the type and amount of dust to be handled.

Exhaust Hoods

Exhaust hoods to a large extent govern the effectiveness of dust control. Therefore, dust producing operations and processes should be as completely enclosed as possible. Next to complete metal enclosure, canvas or rubber drop curtains are recommended. When complete or semi-enclosure of the process is impossible, the exhaust hood should be located as close to the point of dust production as possible. Hood design varies to fit the type of process covered. (Typical hood designs are shown in the various sketches on these pages). Hoods, along with flanges, baffles, skirts, vanes, etc., should direct maximum flow from the dust producing area with minimum flow from surrounding areas where no dust is generated.

Velocity contour curves which are available should be consulted for different hood shapes when the hood is being designed. These curves indicate velocities and flow lines at various distances from the hood and are helpful in selecting hood shape and size.

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more designing enclosures and hoods as a part of their original equipment. This assures a standard hood for each model and provides a more effective hood design than is ordinarily developed in the field by the purchaser of the dust producing equipment.

Piping

The diameter of piping used to connect exhaust hoods to dust collecting equipment depends upon the volume of air to be removed and the velocity at which it should be withdrawn. In many localities codes specify connection sizes and air volumes for various operations, and in other instances pipe sizes are determined by calculation and by experience. When calculating for the cross-sectional area of any pipe, the air volume to be removed—as determined by codes, experience, or experiment—is divided by the velocity recommended to remove the type of dust in question. Cfm capacities of branch lines are totaled to give cfm in main lines.

Suggested general specifications for average duty, industrial exhaust system piping:

1. Keep bottom of pipe straight throughout its entire length — to avoid dirt-collecting pockets. Make changes in area with gradual taper top and side only.
2. Make branch connections only into side or top of tapered section of main-pipe. Angle should not exceed 45°, and preferably be 30°. Branch connections should enter near large end of tapered section, not ahead or behind.
3. Lap joints in direction of air flow. Keep piping free of obstructions.
4. Piping should be substantially supported throughout its length by strap iron, angle or rod hangers.
5. Provide cleanout openings in lower side of pipe at regular intervals and adjacent to bends, junctions, vertical risers, etc. Provide end cleanouts with removable caps.
6. Elbows and bends should be formed with smooth curves having a center line radius equal to twice the pipe diameter and be constructed two gauges heavier than straight pipes of corresponding diameter.
7. Blast gates for system resistance adjustment should be located in branches close to their junction with main-pipe and provided with means for locking in adjustment.
8. Construct piping of galvanized steel with riveted and soldered or lock seam joints; or black steel with welded joints, or the following gauges:

   4" to 12" dia. — No. 20 ga.
   12" to 32" dia. — No. 18 ga.
   32" dia. and over — No. 16 ga.

The Dust Collector

There are a number of types of dust collectors in general use; among them are:

1. Settling Chamber

The simplest and most economical means of removing dust from the conveying air is accomplished through a reduction in velocity causing dust to drop out of the air stream. This method is effective only in removing relatively coarse particles and its application is, therefore, limited. The primary use of the settling chamber is as a presetting means to reduce the dust loading ahead of more effective dust collecting equipment.

2. Centrifugal Type Collector

Centrifugal type collectors utilize radial acceleration of an air or gas stream to separate solid particles suspended and conveyed therein. The common large diameter cyclone is widely used, but is effective principally on coarser particles. Of more recent design are the small diameter high speed and multiple cyclone collectors which accomplish a higher degree of separation through development of higher centrifugal forces, but with resultant increase in resistance.

3. Baffle Type Collector

Essentially a settling chamber fitted with baffles, vanes or deflectors which accomplishes dust

. . . Continued on page 108

5203-B

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. . . Dust Control, from page 107

settling through velocity reduction and centrifugal action. Principally applicable to the removal of coarser particles in higher temperature problems since the design lends itself to all-metal construction. Frequently provided with an auxiliary water spray compartment to improve the overall recovering efficiency.

4. Dynamic Type Centrifugal Collector

This device is essentially a combined fan and centrifugal collector, serving as a source of air movement as well as a means of removing dust through the centrifugal forces developed by the impeller. Applicable principally to the removal of coarser particles and similar in collecting efficiency to a well designed centrifugal collector.

5. Wet Type Collector

In wet type collectors the dust particles are entrapped in a liquid, usually water, and conveyed by the liquid to a settling tank or disposal area. The basic types of wet collectors are water curtain; dynamic precipitator; impingement; and combinations of these types. Wet type collectors are well adapted to higher temperature problems or those involving high moisture content.

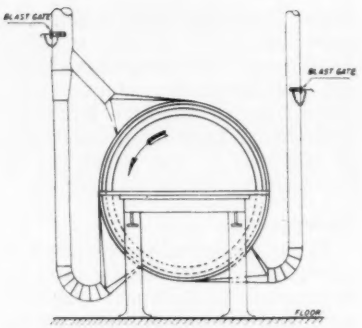

Fig. 1. Hoods should completely enclose dust producing operations whenever possible. Canopy hood can often be fitted with side enclosure to meet this requirement.

6. Electrical Precipitator

Electrical precipitation is the process of removing suspended particles by the aid of an electrical field between electrodes in the air or gas stream. In the usual form of precipitator, the negative electrode is of comparatively smaller diameter and placed close to the positive electrode which is of larger dimensions. The negatively charged particles are attracted to the positively charged electrode and collect on its surface. From here they either drop by gravity into hoppers below, or by interrupting the current and rapping the plate periodically, the precipitated material is dislodged and falls.

Fig. 2. Another canopy hood with side enclosure.

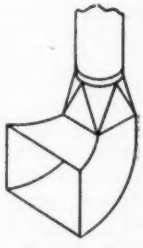

Fig. 3. Lateral hood.

Electrical precipitation has been used extensively for many

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years in the process industries. The overall recovery efficiency of properly designed and applied electrical precipitation equipment is high on all particle sizes. However, due to its (relatively) high initial and maintenance costs, its use has been chiefly confined to higher temperature problems.

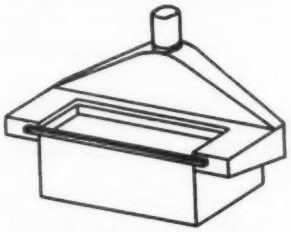


Fig. 4. Slotted hood.

7. Cloth Type Filter

This type of collector filters dust from the conveying air by flowing the air through specially designed filter fabric. Many variations in design are available. The cloth type filter is in general use for problems involving the collection of finely divided dry dusts and accomplishes high recovery at economical cost.

A cloth filter consists of a tight casing enclosing the filter fabric, so arranged that all incoming air must pass through the the fabric to the collector outlet. Upon entering the collector a reduction in velocity occurs, serving to drop the coarser particles of material from the air stream. The remaining dust is conveyed to the cloth surfaces where it is filtered from the air stream, the cleaned air continuing on to the collector outlet. The dust pack or mat thus formed on the cloth surfaces materially assists in improving the overall recovery efficiency.

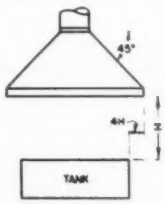


Fig. 5. Plain canopy hood.

In the cloth tube or bag type collector, the filter fabric takes the form of a series of tubes or bags, open at one end and closed at the other, vertically suspended in the casing with the bottom or open end tightly sealed to thimbles in a plate. The dust laden air enters the casing below the seal or thimble plate and passes upward.

The dust is precipitated on the inner surfaces of the tubes or bags. They are attached to a shaking device, which is periodically operated to remove the dust pack from the inner surfaces of the fabric from which it drops into hoppers.

The cloth-screen type collector is a refinement of the tube or bag type. In this type the filter fabric is applied over a series of rectangular frames which effectively support the cloth. The fabric covers both sides and three edges of the frame with the fourth edge left open and in effect forming a flue for clean air outlet. The open ends of the screens are sealed to each other or to the collector casing to divide it into a dirty (dust) side and a (clean air) side. The screen frames are connected to a shaking or rapping device for dislodging the dust pack from the cloth surfaces. Hoppers are provided below the

. . . Continued on page 110

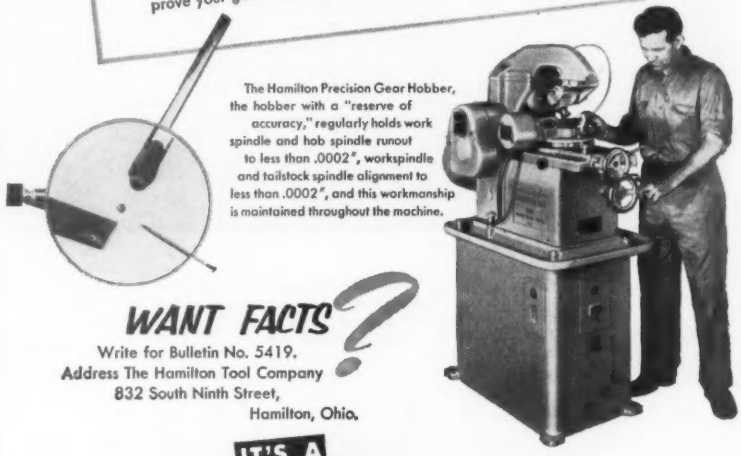
5419

PRECISION GEARS

YOU who use small gears, (to 6" O.D. of the gear blank) can improve the performance of your product, through increased gear precision, without sacrifice of gear production.

YOU who use small, fine pitch, precision gears can increase your gear production without sacrifice of gear accuracy, or improve your gear accuracy without sacrifice of gear production.

The Hamilton Precision Gear Hobber, the hobber with a "reserve of accuracy," regularly holds work spindle and hob spindle runout to less than .0002", workspindle and tailstock spindle alignment to less than .0002", and this workmanship is maintained throughout the machine.



WANT FACTS?

Write for Bulletin No. 5419.
Address The Hamilton Tool Company
832 South Ninth Street,
Hamilton, Ohio.

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CIRCLE INFORM-A-GRAM KEY NO. 1091

. . . Dust Control, from page 109

screens into which the collected dust is deposited.

As the build-up of the dust mat on the cloth surfaces results in a gradual increase in collector resistance, it is periodically necessary to stop the air flow and vibrate the cloth surfaces. With the more common collector arrangement, the intermittent type, the cloth is cleaned by periodic operation of the shaking device with the exhauster shut down. A cleaning period of 5 to 10 minutes after each 4 to 5 hours operation is an average schedule.

The continuous self-cleaning type cloth collector is used for process applications where shutdown periods cannot be permitted. Today, with round-the-clock and 3-shift production on every hand, continuous equipment is more in demand.

The self-cleaning collector uses the principle of reverse air flow for continuous cleaning of the cloth filters. This is accomplished by action of a traveling manifold which includes an integral reverse air blower that takes its air directly from the clean air side of the collector.

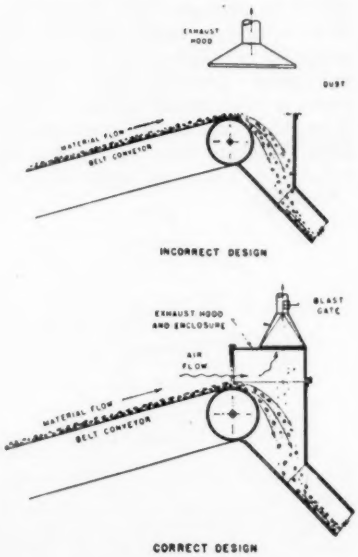

Fig. 6. Hood arrangement for disc sander.

With cloth filters, the more important limiting factors are temperature, moisture, and chemical qualities of both the dust and the conveying air or gas. The limiting temperatures for the filter fabrics in most general use are approximately 175°F for cotton and about 225°F for wool. Some of the newer synthetic fiber fabrics will permit a considerable increase in practical operating temperature ranges. Improved chemical resistance is also possible through use of these new fabrics.

When containing moisture the conveying air and collector temperature must be maintained above the dewpoint to prevent condensation within the collector resulting in sludging the dust on the cloth surfaces.

Factors governing the cloth filter recommendation for each application are the air volume handled; nature, characteristics and amount of material to be collected; and range of dust particle size and specific gravity. The size of a cloth filter, i.e., the filtering area, is governed by consideration of these factors. The filtration velocity used with intermittent type collectors will vary with specific problems of average nature in the range of from 2 to 4 lineal fpm. This is more commonly termed "ratio," meaning 2 to 4 cfm passing each square foot of filtering area. With con-

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Tool grinding wheels

IT'S A FACT!
Tool Room Wheels made with Mid-West's exclusive S11A grit (developed and produced in Mid-West's own Abrasive Grain Plant) more than likely can perform your tough tool grinding operations more efficiently and more economically. Yet, S11A is not a premium priced abrasive grain.

A FACT THAT CAN BE PROVED!
For in the tool rooms of Mid-West customers all over the country, S11A wheels, combined with Mid-West's exclusive vitrified bonds have been tested time and time again with these results: *Operating costs were cut, while grinding efficiency increased!*

Check with your nearest Mid-West representative today for detailed information related to your particular operation, or, write direct to:

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EXECUTIVE OFFICES:
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MID-WEST QUALITY ABRASIVES

CIRCLE INFORM-A-GRAM KEY NO. 1101

tinuous type collectors, the "ratio" is frequently increased.

High dust loadings are reduced by presettling devices installed ahead of the cloth filter. This presettling is accomplished by a centrifugal or cyclone collector, settling or baffle chamber, or other devices effective for partial precipitation.

The Exhauster and Drive

The exhauster, or fan, maintains air flow through the exhaust system. The exhauster size is determined by the total air volume to be handled and the total resistance of the system. This air volume is the sum of the volumes exhausted from the hoods, usually plus a 10% allowance for system leakages. The total resistance of the system is the sum of (a) hood entrance loss, (b) maximum velocity head, (c) frictional resistance of most resistant branch including bends and entrance into main, (d) frictional resistance of main exhaust pipe, (e) collector resistance including entrance and discharge losses, and (f) frictional resistance of exhauster inlet and discharge piping.

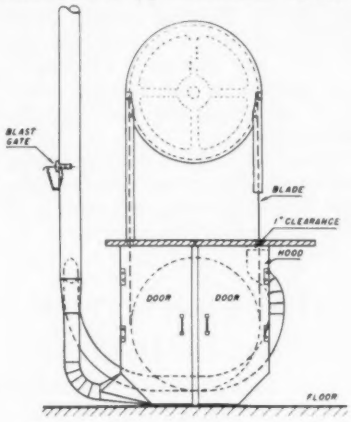

Fig. 7. Hood arrangement for band saw.

Exhausters of the steel plate planing mill type are most commonly used for exhaust systems, particularly when handling dust through the fan. There are two general wheel designs available, the radial blade (paddle wheel) and the slow speed, or forward curved blade.

In suction type installations, particularly when using cloth filters with the exhauster handling cleaned air, higher efficiency fans similar to those for ventilating work are used, the more common designs being the multiple forward curved blade type and the backward curved blade, or high speed type. While these exhausters are similar in design to those used in ventilating and air conditioning work, they are usually of heavier construction throughout for exhaust system application because of the higher pressures required.

Exhausters are driven by motors, either direct connected or through flat belt, chain or multiple vee-belt drive. The multiple vee-belt drive predominates because of low initial cost, minimum slip with short centers, and flexibility for speed change. Direct driven exhausters are not advocated for industrial exhaust system applications.

Correctly designed systems pay their own way both in tangible and intangible savings. Collected waste, better workmanship, unsoiled finished products, greater visibility within the plant, less frequent painting, and longer life of operating equipment are all specific savings which can be credited to dust control equipment.

BRAWN
YOUR PRODUCT'S MOST EXPENSIVE FACTOR

Of all that contributes to the production of your product, labor is the most costly.

Of all that contributes to the reduction of costs, a simple mechanical means for handling compact, heavy loads is the least costly, easiest to install, most widely used by workers.

PORTELVATOR®
THE HANDY HAMILTON PORTABLE ELEVATING TABLE
FITS THAT NEED

Built standard to handle loads of 1000 to 5000 pounds, Portelvator features the original worm, worm gear, and screw principle of power transmission, plus three table surfaces, plus four point support.
Prices start at $155.00—Install a couple without delay, and watch results.

Complete information in FREE Bulletin No. P-5404. Write for it! Address The Hamilton Tool Company 832 South Ninth Street, Hamilton, Ohio

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CIRCLE INFORM-A-GRAM KEY NO. 1111

Universal Grinder For Large Accurate Work

Finishing of such large parts as pipeline valve plugs and their mating seats, normally a tedious hand job, now can be done quickly with a new 42″ vertical universal grinder.

The 3-TR grinder, which has a normal maximum swing of 52″, is hydraulically operated and requires a minimum of attention from the operator after setup. All operating controls are on a push-button pendant station.

While it does all types of vertical grinding, the new machine is particularly useful on work requiring extreme accuracy and concentricity. The head can be set at any angle up to 45°, and with one angle setting the machine can finish both male and female parts for perfect fit. Surface grinding likewise is within its capacity. Thus multiple operations are possible with one chucking.

Photo courtesy of The Springfield Machine Tool Co.

Holes, either tapered or straight, can be ground to a depth of two feet. The standard machine is equipped with a single head, but modifications permit two or more heads.

Work spindle speeds range up to either 88 or 176 rpm in either direction. The grinding head stroke is 27½″ at speeds up to 185″ per minute. Maximum clearance over the 42″ face plate is 25″, and over the work spindle 30¾″.

The 10-hp wheel spindle motor turns at 3600 rpm, and the 7½-hp hydraulic system motor at 1200 rpm.

IMS Eighteenth Annual Meeting

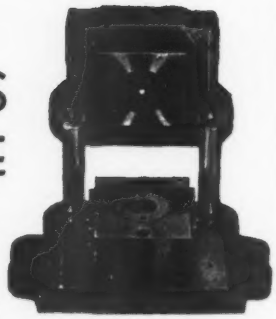
The Eighteenth Annual Time and Motion Study and Management Clinic sponsored by the Industrial Management Society will be held on November 10-11-12, 1954, at the Sherman Hotel, Chicago. More than 2000 industrial engineers, works managers, plant superintendents, and supervisors are expected to attend.

Topflight industrial leaders from all over the U. S. will discuss the latest developments in the fields of time study, motion economy, job evaluation, methods, plant layout, etc.

Feature of the event will be the results of the Annual Methods Improvement Contest, with awards being made to companies and colleges for outstanding advances in industrial engineering techniques and applications.

"A MUST wherever WASHERS are made!"

HOVIS
OFFERS YOU THIS SIMPLE, UP-TO-THE MINUTE METHOD



There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.

Made in 5 sizes:
¾″—1½″—2½″—4″—6″

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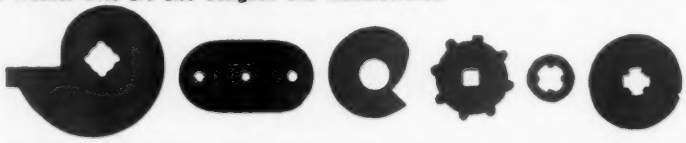


HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD VAN DYKE, MICHIGAN
Phone: Slocum 7-4800 Suburb of Detroit

CIRCLE INFORM-A-GRAM KEY NO. 1121

GROWING PAINS

Grieve-Hendry Co., Inc., manufacturers of laboratory and industrial ovens, is moving its factory to larger accommodations. Expansion of the Chicago firm has been made necessary because of continued growth and the introduction of many new and larger models of ovens for industrial processing.

◆

The Packard Motor Car Co. plans to install its manufacture of engines, automatic transmissions, and axles into a new multi-million dollar plant in Utica, Michigan, just outside Detroit. Installation of machines and tools in this plant is scheduled for completion in time for 1955 models.

◆

Building construction has been completed and pilot operations are under way in a new plant built by the **Goshen Rubber Co., Inc.,** Goshen, Ind. Located adjacent to the main plant, the new structure, when in full operation will house the latest facilities and departments, including presses, mills, extruders, curing ovens and trimming equipment.

◆

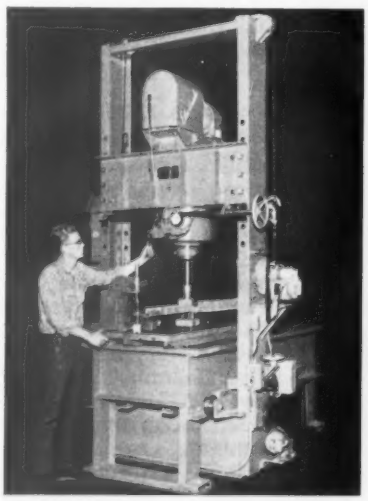
Atlas Chain & Mfg. Co. has opened its new home office and factory in Doylestown, Pa. The company, maker of precision built roller chains, has for a number of years been identified with Philadelphia. The new Doylestown headquarters augment the northeast Philadelphia plant. Officials of the company describe the move as part of a plan to increase and centralize production facilities, and to gain space for future expansion.

◆

The Westinghouse Electric Corp. has announced plans to expand its Small Motor Division operation by constructing a new plant at Upper Sandusky, Ohio. The new plant will produce the smaller sizes of fractional horsepower motors. Construction is expected to be started shortly on a site covering 20 acres in the southern part of the small Ohio town. Present plans for the plant call for a one-story building with approximately 60,000 sq. ft. of floor space which, with machinery, would cost more than $1,000,000. The building will be designed so as to permit future expansion when required.

F. J. Stokes Machine Co. has launched a $1 million expansion program which will enlarge its production facilities by another 40%. Ground has been broken for a 50,000 sq. ft. addition to the present plant in northeast Philadelphia, which will provide additional manufacturing space and larger office and engineering department accommodations. Erection of steel is scheduled to begin by early fall and the new building should be completed by the end of the year.

When the mountain wouldn't come to Mohammed



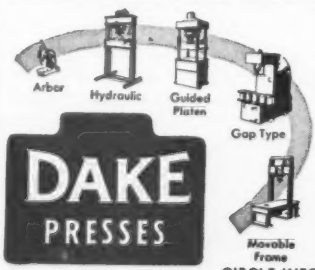
Tradition says that the mountain didn't come when Mohammed commanded, so he resolved the situation by going to the mountain.

The same strategy makes the Dake Movable Frame Press unique among presses. Instead of moving the work under the press, the press is moved over the work. The frame moves longitudinally and the work-head moves laterally or vertically to any position over the worktable.

The advantages of this arrangement are many. For example, at left a Dake Movable Frame Press is used for straightening aircraft forgings. Once the forging is mounted on supports, and gauges have been placed, pressure can be applied at any desired point without disturbing the setup.

Support points can be spread to the extreme edges of the large table for work on long or irregularly shaped pieces. Work too heavy or awkward to handle manually, can be set on the table with an overhead crane, and the press moved into position.

Dake movable frame hydraulic presses can be electric or air powered, and are available in 25- to 300-ton capacities. Write for Bulletin No. 269.

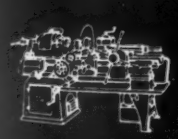


DAKE PRESSES

Send for Big New Catalog

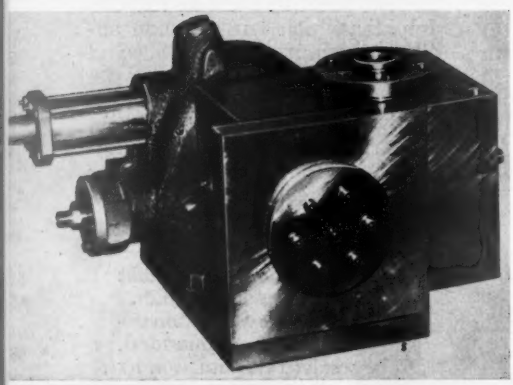
DAKE ENGINE COMPANY
634 Seventh St., Grand Haven, Mich.
Please send me a copy of Dake Catalog No. 129
Name_____
Company_____
Address_____
City_____ Zone____ State____

CIRCLE INFORM-A-GRAM KEY NO. 1151



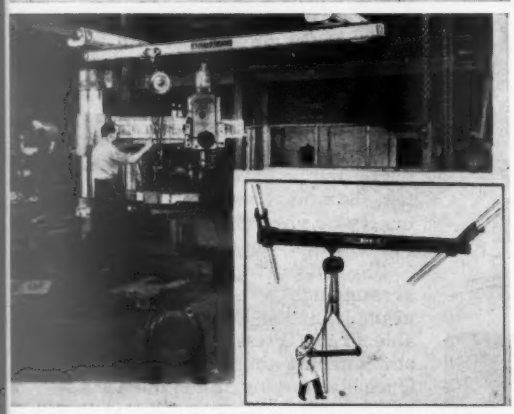
PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS



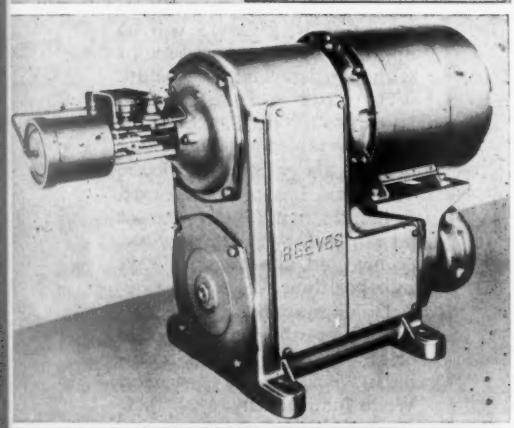
SPEED INDEXER . . .

Designed to speed up and simplify accurate positioning is a new speed indexer announced by the Erickson Tool Co., 23rd and Hamilton, Cleveland 14, Ohio. Known as the Erickson Multiple Position Indexer No. 477, it accurately indexes up to 500 positions depending on the gear ratio and index plate ordered. Complete data is available.
Inform-A-Gram No. A1.



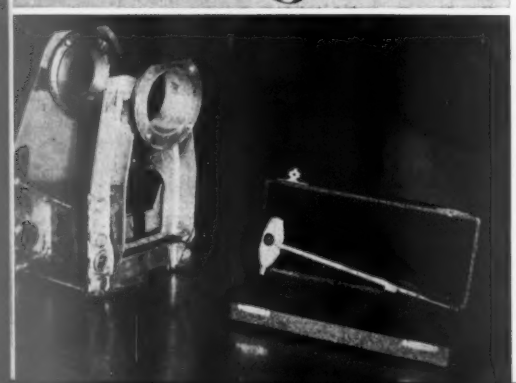
PUSH-TYPE CRANES . . .

Here you see an Industrial push-type crane handling heavy, bulky Diebel high production presses. This, like other Industrial cranes, is available in various spans, can be equipped with hand operated or electric hoists, and is featured in Catalog PT-1253 available from the Industrial Crane & Hoist Corp., 315 N. Ada St., Chicago 7, Ill.
Inform-A-Gram No. A2.



PROCESS CONTROL . . .

The Reeves auto-pneumatic control of variable speed drive provides a new, more accurate means for automatic process control by continually correcting operating speeds for changes in material and/or energy variations of a process. The Reeves Pulley Co., Columbus, Ind., offers Bulletin M-542 for further information on this development.
Inform-A-Gram No. A3.

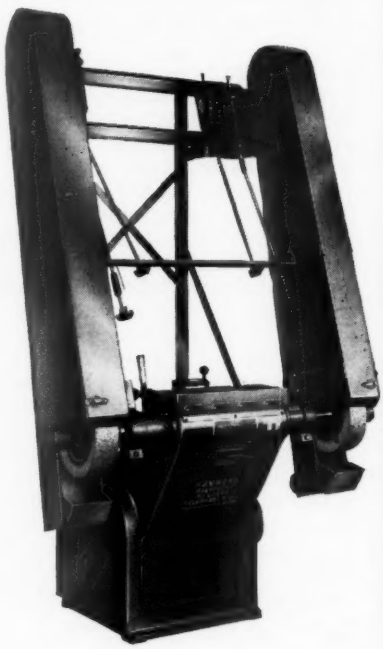


"OPTI-MIKE" . . .

This new instrument enables an unskilled operator, after only a few minutes of instruction, to make a quick and accurate measurement of a bore diameter. It is made by I.G.M.A., Inc., 347 Madison Ave., New York 17, N. Y.
Inform-A-Gram No. A4.

POLISHING & BUFFING . . .

This wide swing polishing and buffing lathe is a two-spindle machine with each spindle having its own motor, motor control and V-belt drive—allowing each operator to change wheels



without interfering or causing downtime for the other. Each spindle runs in three ball bearings, one in the end of the spindle which is a part of the special outboard bearing assembly. The heavy duty construction and rigidity of the outboard bearing permits the use of wheels up to 16" face on each spindle. This lathe is especially suited for polishing and buffing of large irregular shaped parts either by hand polishing or in conjunction with semi-automatics. For further information, write to Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich., or—
Circle Inform-A-Gram No. A5.

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

TAPPING HEAD . . .

A new, complete lead screw tapping head that enables unskilled help to produce precision threads on any drill press has been announced by Automatic Methods, Inc., 965 W. Grand St., Div. 205, Elizabeth, N. J. The new head features a rapidly interchangeable lead screw, a new type cone clutch reversing mechanism, and a positive depth control to assure perfect threads

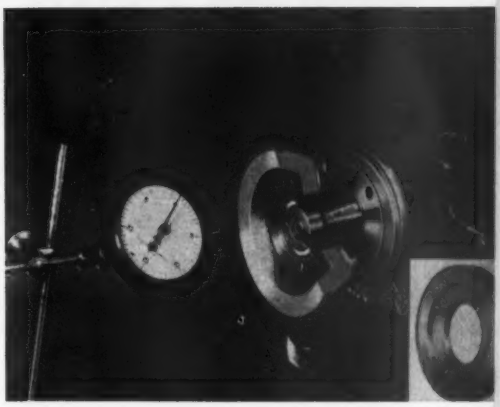
even in blind or recessed holes. Higher production is made possible because the tap withdraws faster, the floating workpiece is positioned rapidly, and operator fatigue is reduced. Tap breakage and work spoilage are reduced because the mechanism is actuated before the tap engages the work and the lead screw guides the tap in and out of the work. The heads are available for tapping #0 to 5/16" and # 10-32 to ¾" threads.

Circle Inform-A-Gram No. A6.

FOR DIAMOND WHEELS

Here is a device for truing diamond wheels accurately and speedily. The Easy-Tru collar eliminates paper shimming, extends diamond wheel life and saves man-hours of truing time. The collar allows the wheel to be trued to 0.0005". Complete data is available from the Queen City Carbide Tool Co., 2339 Gilbert Ave., Cincinnati, Ohio.

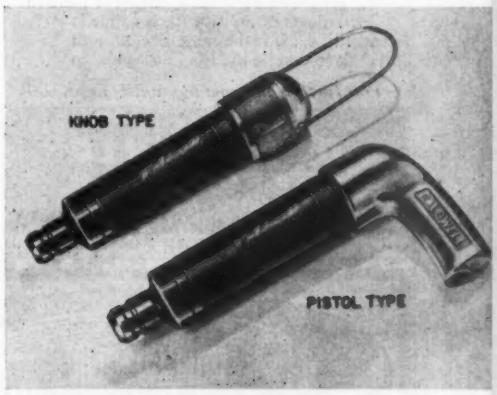
Inform-A-Gram No. A7.



AIR TOOL . . .

This air hammer can be used for drilling, chipping, trimming, scaling, sealing, and various other applications. It only measures 9¾" in overall length, has a 1⅝" barrel diameter, and weighs approximately 5 lbs. Complete information can be had from the Burgess Thomas Co., Dept. "C", Box 287, Bloomfield, N. J. Write direct to the company, or—

Inform-A-Gram No. A8.



WHEEL DRESSER . . .

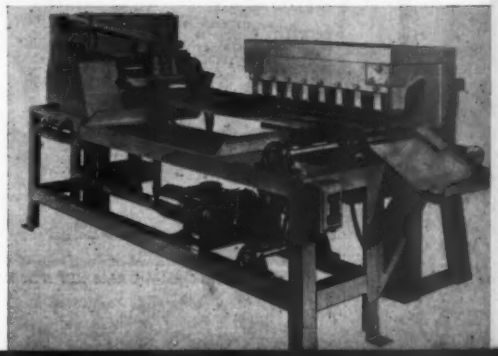
A new model in its line of automatic grinding wheel dressers has been introduced by Hoglund Engineering & Mfg. Co., Inc., 343 Snyder Ave., Berkeley Heights, N. J. Designed for surface grinders and hydraulically operated, it can be used for any form that can be entered by the diamond, and little operating skill is required. Further data is available.

Inform-A-Gram No. A9.

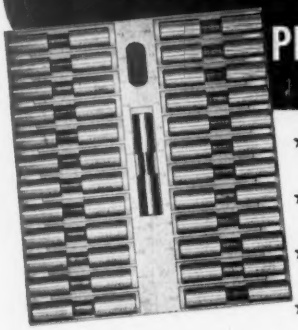
BAR STOCK HEATING . .

A new mechanical development, which puts endheating of bar stock for upsetting on a completely automatic basis, has been announced by Gas Appliance Service, Inc., 1211 Webster Ave., Chicago 14, Ill.

Inform-A-Gram No. A10.



CLOSER TOLERANCES with DELTRONIC TENTH PLUG GAUGES



★ Size variation by ten thousandths

★ Set of 25 costs approximately same as Go and No-Go gauge.

★ Available in increments of 1/64" from 1/8" to 1"

★ Hardness is Rockwell C62/C64

This new system of precision gauging provides one gauge of nominal size plus 12 gauges of increasingly larger sizes in .0001" increments and 12 gauges of decreasingly smaller sizes in increments of .0001". Each gauge is identified. It is the same size on both ends to double the life in usage.

For further information write Dept. D1.

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9010 BELLANCA AVENUE • LOS ANGELES 45, CALIF.

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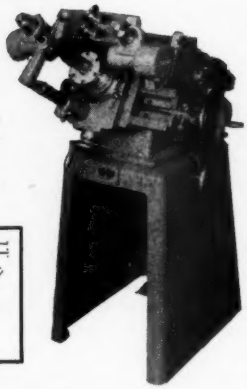
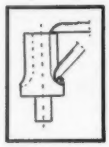
Punches Shaped from the SOLID with OTTMANN Punch Shaper

FEATURES:

1. No holder plates required.
2. Simple work mounting.
3. No re-setting — Work can be adjusted to any position of tool.
4. Forms shaped accurate. Parallel and true.





5. Minimum hand work.
6. Convenient, simple operation. Uses standard shaping tools.

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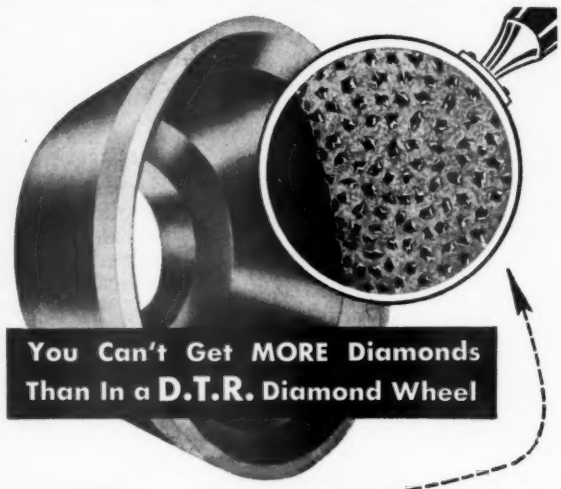


You Can't Get MORE Diamonds Than In a D.T.R. Diamond Wheel

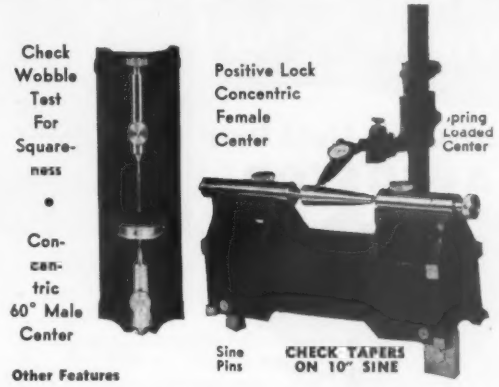
WHEN you buy a DTR diamond wheel you get the maximum quantity of diamonds and the highest quality of diamonds provided by any manufacturer in any resinoid bonded diamond wheel. Since there is absolutely no substitute for the quality and quantity of diamond abrasive grains used in a diamond wheel, a DTR diamond wheel cuts carbide FASTER, COOLER with GREATER ECONOMY.

Ask about our special discount
Send for new Diamond Wheel Catalog

DTR
DIAMOND TOOL RESEARCH CO., Inc.
380 Second Ave. • New York 10, N. Y. • GRamercy 5-3530
Industrial Diamonds • Diamond Tools • Diamond Powder • Diamond Wheels and Hones

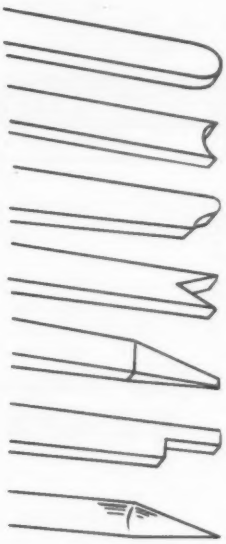
CIRCLE INFORM-A-GRAM KEY NO. 1164

New "Surfcenter." Weighing only 21 lbs. and just 12" long is the new Universal test center which may be used on any surface plate in vertical, horizontal, or

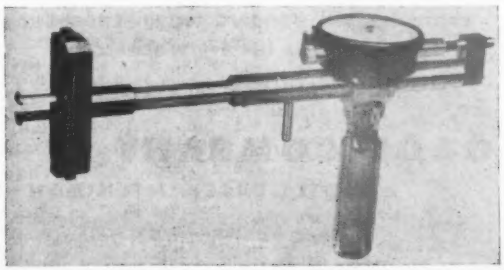


angular position, without use of special indicator bases or clamping on of angle plates. The Inspection Devices Co., 5636 S. Lake Park Ave., Chicago 37, Ill., offers complete data on this instrument. **Inform-A-Gram No A11.**

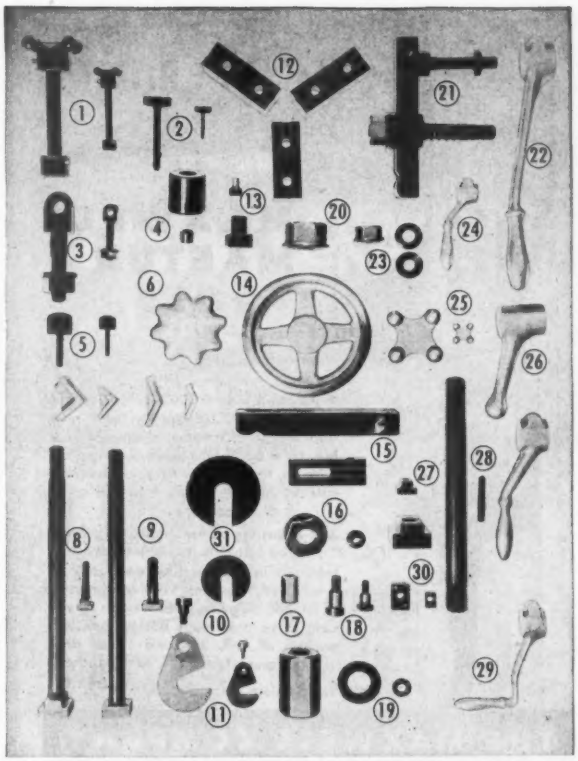
A Recently Expanded line of abrasive sticks and blocks to include a larger selection of sizes has been announced by the Sandusky Abrasive Wheel Co., 636 W. Ransom St., Kalamazoo, Mich. Now 22 sizes are available in rectangular, square, cylindrical and triangular shapes ranging from 3" to 8" long. For use dry or with water, the sticks are made of abrasive grains embedded in pliable rubber. They are recommended for finishing, polishing, removing rust, deburring, sharpening tools, and honing. Mechanical polishing is also possible by revolving a cylindrical object and holding an abrasive stick against it. Literature and prices are available from the manufacturer. **Inform-A-Gram No. A12.**



A New Internal Groove Gage Head designed to accurately check diameters of a wide range of "O" ring grooves, snap ring grooves, and short counterbores is



now being offered by the Rimat Tool Co., 21 W. Dayton St., Pasadena 2, Calif. The new gage head will read accurately to 0.0001". A catalog describing this product is available.
Circle Inform-A-Gram No. A13.



OVER 500 JERGENS STANDARDS SAVE TIME--LABOR--⅔rds THE COST

Illustrated above are just a few of the more than 500 Jergens Standard Jig & Fixture Components. One of the most complete lines in production today, mass-produced Jergens Standards save you the skilled tool and die room help necessary for the custom making of component parts in your own shop. Keyed to the photograph and listed below is a brief description of a number of these items now immediately available from stock. Write for descriptive catalog and price list.

1. Clamp Shoe Assemblies—14 sizes—alloy steel screws—hardened steel shoes with snap ring lock.
2. Thumb Screws—4 sizes—3 lengths each size.
3. Latch Screws—4 sizes—hardened.
4. Jig Rest Buttons—4 sizes—hardened—ground.
5. Quarter Turn Screws—9 sizes—soft steel.
6. Palm Grip Hand Knobs—with reamed, tapped, or square hole.
8. Tee Slot Bolts—standard sizes ⅜" to 1"—various lengths.
9. Tee Bolts—standard sizes ½" to ¾"—various lengths.
10. Shoulder Screws—for use with swing "C" washer.
11. Swing "C" Washers—4 sizes—comes with shoulder screw.
12. Blank Soft Chuck Jaws—19 standard sizes—S.A.E. 1020 Steel—in stock to fit approximately 273 master chucks at a moment's notice—special blanks made on request.
13. Rest Buttons—4 sizes—hardened—ground.
14. Hand Wheels—4 sizes 6" to 12" in diameter—aluminum alloy.
15. Strap Clamps—hard and soft—plain or with radius.
16. Flange Nuts—9 sizes—hardened.
17. Extension Nut Couplers—8 sizes—alloy steel.
18. Shoulder Screws—24 sizes—Hex head socket—160,000 to 180,000 P.S.I.
19. Plain Flat Washers—8 sizes—hardened—ground.
20. Spherical Flange Nuts—9 sizes—hardened—ground.
21. Strap Clamp Assemblies—comes with spherical flanged nut assembly or hand knob for clamping the strap.
22. & 24. Offset Handles—aluminum alloy or malleable casting.
23. Spherical Washers—hardened—ground.
25. Hand Knobs—aluminum alloy casting.
26. Clamping Levers—aluminum alloy or malleable casting.
27. Tee Nuts—14 sizes—hardened.
28. Studs—stress-proof steel.
29. Crank Handles—aluminum alloy or malleable casting.
30. Fixture Keys—(hard or soft)—ground.
31. "C" Washers—22 sizes—4, 5, and 6 diameters each size—ground.

Jergens MITER TOOLS AT LOWER COST
TOOL SPECIALTY CO.
712 E. 163rd ST., CLEVELAND 10, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1171

PRECISION BORING

WITH

MAXWELL MASTUR TOOLS

• Adjustable to 0.0002-inch, the new improved MASTUR boring tools feature precision, speed and long service life. New body and block construction permits these tools to take heavier cuts at higher speeds — to do more work in less time.

Adjusting-screw head is graduated into 50 divisions to provide readings in thousandths, and body is graduated to permit vernier readings of 0.0002-inch. The three models available have maximum boring bar capacities of 1/2, 3/4 and 1-inch and boring range from 3/8 to 15 inches.

Write for catalog.

867-MC

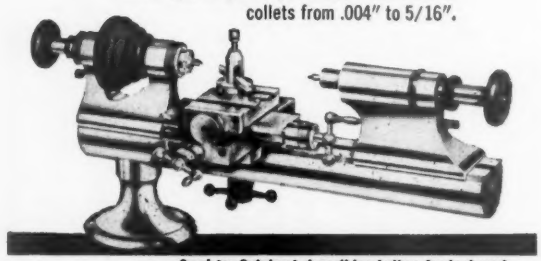
THE MAXWELL COMPANY

250 BROADWAY BEDFORD, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1181

SMALL INSTRUMENT PARTS ARE MADE BEST ON LEVIN® LATHES

Twenty-three models for all types of work. 4" swing, Bed Length 12" or 18"; over 100 stock sizes of collets from .004" to 5/16".



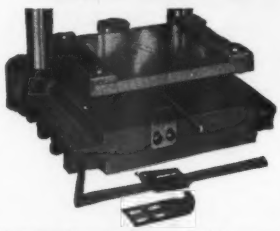
Send for Catalog L describing Lathes for tool work, second operations; turrets and full line of accessories.

LOUIS LEVIN & SON, INC., 3610 S. BROADWAY, LOS ANGELES 7, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 1183

Adjustable Automatic Stock FEED STOP for DIES

Dahlstrom Light Duty AUTOSTOP



No drill jig...
No slotting...
No milling...

$1.75

TO INSTALL: Just drill one 7/32-inch hole, then drill and tap four mounting holes per directions. That's all there is to it!

Trial order $1.75 each; lots of 12 $1.50 each. State whether for use on compound or progressive dies. *Write for free pamphlet.*

Tested and improved through the years, the Dahlstrom Autostop will save hours of your high priced labor. Adjustable to work with blanking, progressive and compound dies. Mounts on stripper plate in 15 minutes. Handles sheet steel up to 1/16" x 6" or equivalent weight.

By the makers of the **DAHLSTROM TAP GUIDE**

Branch MANUFACTURING COMPANY

NORTH BRANCH • MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1182

Gage Company PRECISION PLASTIC

COMPARATOR SCALES

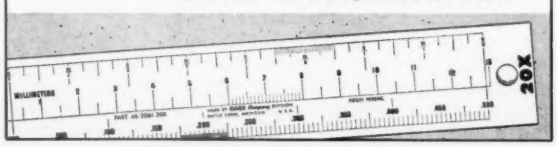
Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

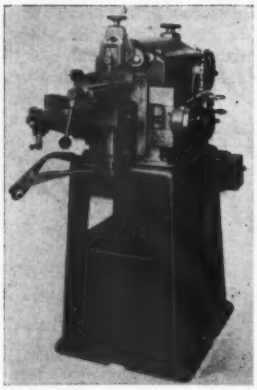
WRITE FOR BULLETIN NO. 54-1511

GAGE COMPANY

BATTLE CREEK, MICHIGAN

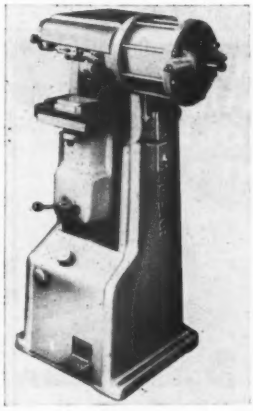


CIRCLE INFORM-A-GRAM KEY NO. 1184



A Low-Priced Hydraulic Shaper for tool room, production, or copying work is now being marketed by the American Herforder Corp., 1546 N. Orleans St., Chicago 10, Ill. The machine is capable of copying at a 1:1 ratio the most intricate work. The work may be held in the quick-acting vise or between accurate 360° indexing centers while the tracer follows the contour of a simple template. Complete literature is available from the company.
Inform-A-Gram No. A14.

A New Mobile Tool Stand, particularly useful for assembly, inspection and maintenance has been developed by the Standard Pressed Steel Co., Jenkintown, Pa. Made of heavy gauge steel and mounted on 2½" swivel casters, the stand has a cabinet and two drawers with the top serving as a recessed tray. It is easy to assemble and comes in baked-on SPS standard green enamel. Literature available.
Inform-A-Gram No. A15.

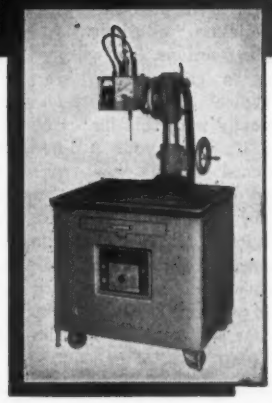


"Air-Draulic" Marking Machine. Standard units for light and heavy duty production marking of round, flat and contoured parts are now available from Jas. H. Matthews & Co., 3927 Forbes St., Pittsburgh 13, Pa. The machine rolls permanent impressions—from a single character or trade mark to several lines of lettering 3½" long—on parts up to 6" in diameter. Write direct to the company for further data, or—
Inform-A-Gram No. A16.

Handgrinder. Intended primarily for heavy-duty production jobs is this Series 9 handgrinder. It is recommended for polishing casting and weld seams, spark testing steel, polishing and grinding heavy and irregular work. Chuck, ¼" capacity, is furnished for use with mounted wheels in grinding tight spots, radii, die molds, etc. The handgrinder has a ¼ hp continuous-duty rated universal motor which develops 15,500 rpm. For complete details write to Dumore Precision Tools, The Dumore Co., 1300 17th St., Racine, Wis., or—
Inform-A-Gram No. A17.

METAL DISINTEGRATION

and what it can do for you



Literally hundreds of thousands of dollars are saved annually by corporations that are using Metalmasters in just tool and die repair alone.

There's a technical engineer in your area to give you an on-the-spot demonstration in your own plant at your convenience. (NOTE: It is not uncommon to pay for a Metalmaster with just one short demonstration through savings on workpieces.

There's a Metalmaster designed for your operation and priced to fit your needs. For information as to the many uses and benefits Metalmaster can offer you, write today on your company letterhead to:

Metalmaster
DIVISION OF CLINTON MACHINE COMPANY
CLINTON, MICHIGAN

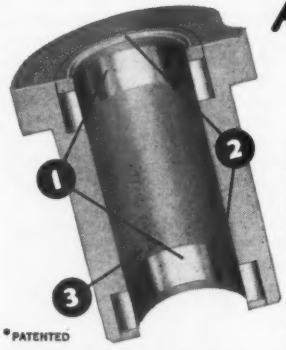
CIRCLE INFORM-A-GRAM KEY NO. 1191

NEW ADJUSTABLE DRILL JIG
eliminates layout; cuts drilling time

Used for drilling holes through round stock and hex stock from ¼" to 2" and cap screws from ¼" to 1¼", the new Mathewson Adjustable Drill Jig eliminates layout and can cut drilling time on small lots to a fraction. And it eliminates the costs of special jigs for larger quantities. Holes for cotter pins, set screws, drive pins for bayonet joints, oil holes in tubular sections, and wiring holes in cap screws, are all typical of the operation that can be done more economically with this jig. Hole diameters range from .052" to .531", using your A.S.A. standard slip bushings. The hardened V-block has two 60-degree V's for centering round or hexagonal stock, one for ¼" to 21/32" diameter, one for 21/32" to 2" diameter. Adjustable stop for locating work longitudinally for drilling any distance from end, may be used on either side. Adjustable bushing carriers hold slip bushings and clamp work securely. Jig highly successful in permitting use of inexperienced drill operators. For circular write to: **Mathewson Machine Works**, 38 Hancock St., Quincy, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1201

MORE HOLES— MORE ACCURACY— FASTER— AT LESS COST



MEYCO
Carbide Inserted Bushings Are Doing It Daily!

HOW? Like this: (1) Last longer . . . with a life—in most cases—as long as solid carbide bushings at prices that come close to the prices of ordinary steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man-hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!

*PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

For information and prices write for Meyco Bushing Catalog No. 17

W. F. MEYERS CO., INC., BEDFORD, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1202

10 R. D. T. subcontract facilities
WILL CUT YOUR COSTS

FIXTURES
TOOLS • GAGES • HORIZONTAL BORING • PRODUCTION TURNING, MILLING, GRINDING, DRILLING • SPECIAL MACHINING • SPECIAL MACHINERY

• Cost of R.D.T. subcontract facilities is only a fraction of the cost of adding these same facilities to your own plant.

But, your savings don't stop here . . . Time and again, R.D.T. has called upon their years of experience and production "know-how" to reduce "necessary operations" to a minimum, thereby, effecting substantial savings in time and money.

Let us show you how you *can enjoy these savings in production costs.* Write for facilities brochure and equipment list.

ROCKFORD DIE & TOOL WORKS, INC.
1816 Seventeenth Ave.
ROCKFORD • ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1203

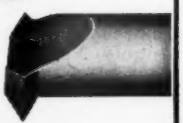
THEN USE THE 3 COMET "TIPS"

MADE OF HIGH SPEED or CARBIDE
FOR HOLES FROM 1/16" UPWARD
17 DIFFERENT SIZES

BORING TOOL
• FAST PERFORMANCE
• ECONOMY IN PRODUCTION
• EFFICIENT IN RESULTS
Cutting Edges are lapped for better "Bores" and Faster Feeds.

FACING TOOL
• CONSTANT CLEARANCE • EASY RESHARPENING
• CONSTANT SHAPE OF CROSS SECTION
• CONVENIENT TO USE • LONG LIFE

INTERNAL THREADING TOOL
• CONSTANT SHAPE AND CLEARANCE
• EASY RESHARPENING • LONG LIFE



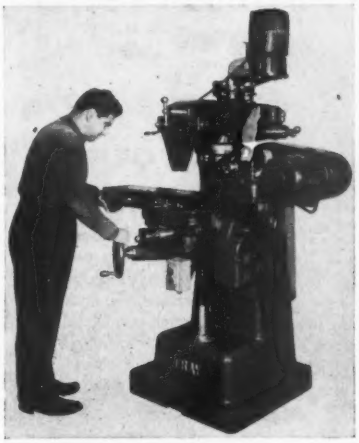
WRITE FOR COMPLETE DATA

COMET Tool Co.

738-T BROADWAY, NEW YORK 3, NEW YORK

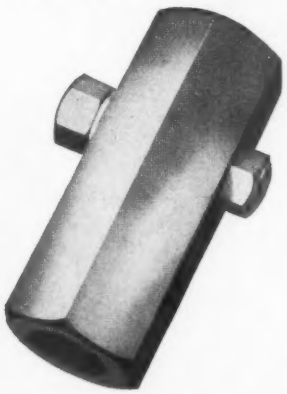
CIRCLE INFORM-A-GRAM KEY NO. 1204

Power Feed Attachments, designed to increase milling machine flexibility and to speed production, are now available for Fray milling machines. The units are of two types: a table feed for Models 10-R and



10RH; and a power down feed for the type 4 Fray all-angle milling attachment. Further information can be had from the Fray Machine Tool Co., 2935 N. Ontario St., Burbank, Calif.
Circle Inform-A-Gram No. A18.

⅜" Flow Control Air Valve. A new valve to meter flow in one direction and allow free flow in the opposite direction has been announced by the Rivett Lathe & Grinder, Inc., 18 Riverview Rd., Brighton, Boston 35, Mass. The valve features an anodized aluminum body and a nylon poppet. The



corrosion-resistant adjusting screw has a slotted hex head which may be turned with a wrench or screwdriver. Tightening the hex nut on the opposite end of the adjustment screw locks the setting. The valve is recommended for 150 psi air or 300 psi oil or water. The new ⅜" size valve has a 3" length x 1⅛" hex and weighs only 6 oz.
Circle Inform-A-Gram No. A19.

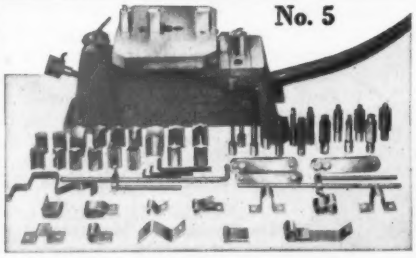
Hey! That's not the way to use Columbia's good FIREDIE Hot Header-Die Tool Steel.

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

CIRCLE INFORM-A-GRAM KEY NO. 1211



WRITE FOR DESCRIPTIVE CIRCULAR

Multiform

BENDER-CUTTER

CUTS, BENDS, PUNCHES

Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ½"x1½" as illustrated. Punching and round end blanking dies available. Other models up to ¼"x 4" air operated.

ALSO AIR OPERATED MODELS.

J. A. RICHARDS CO. KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1212

STOP DUSTS INSTANTLY

with

DUSTKOP

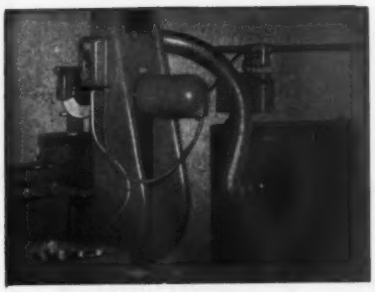
Available from stock of 22 standard models.

300 cfm to 10,000 cfm

Ask for Catalog 605-2. Describe dust problem for recommendation by return mail—No Obligations.

AGET-DETROIT CO.

213 Main St., Ann Arbor, Michigan



CIRCLE INFORM-A-GRAM KEY NO. 1213

Order Zagar Collets and Collet Fixtures at These Low Prices

Zagar has a fixture for every collet tool application. Order NOW from your local tool supplier.

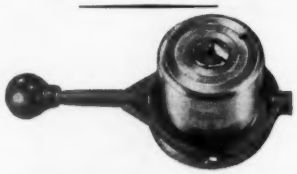
STOCK DELIVERY!

ZAGAR INDEXING FIXTURE

1"—$185
2"—$285

ZAGAR HOLDING FIXTURE

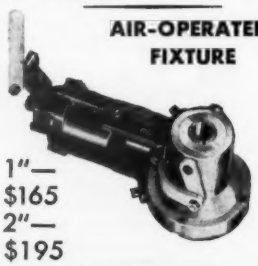
1"—$95 2"—$145



COLLET LATHE CHUCK

1"—$125 2"—$185

AIR-OPERATED FIXTURE



1"—$165
2"—$195

VERTICAL-HORIZONTAL FIXTURE

1"—$115
2"—$185

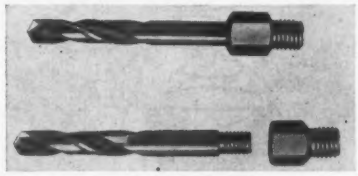
5-C Collet
1"—$4.90
W & S No. 2 $6.75

ZAGAR TOOL, INC.
24000 LAKELAND BLVD., CLEVELAND 23, O.

Zagar TOOLS For INDUSTRY and SPECIAL MACHINERY

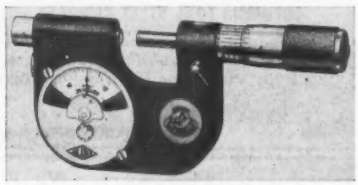
CIRCLE INFORM-A-GRAM KEY NO. 1221

For Drilling Holes in narrow and inaccessible places, such as airframe fuselages, wing and tail surfaces, or other complex sheet metal shapes, a new drill for use with flexible drive shafts or extension arms has been



developed. The old method was to use an adapter with a threaded shank drill (see bottom of photo); now the two are combined in one unit. Further information is available from the National Twist Drill & Tool Co., Rochester, Mich.
Circle Inform-A-Gram No. A20.

Precision Dial Micrometer. This instrument combines the precision of the dial indicator with the accuracy of the micrometer screw, eliminating the chance of human error "feel", common to setting an ordinary micrometer. Since it can be



set to the required size and locked before gaging parts, it eliminates the need for "go" and "no-go" gages. Both the dial and the barrel are graduated in 0.0001". For further information, write to the Alina Corp., 401 Broadway, New York 13, N. Y., or—**Inform-A-Gram No. A21.**

Electro-Chemical Marking. An improved, simplified approach to electro-chemical marking is offered in the new E-Z Mark Etcher made by the Crown Industrial Products

Co., 908 Amsterdam St., Woodstock, Ill. It is designed for production marking or individual identification and takes little time to set up. The etcher, also, is well suited for marking hardened and ground surfaces (see photo), aluminum, and stainless steel.
Circle Inform-A-Gram No. A22.

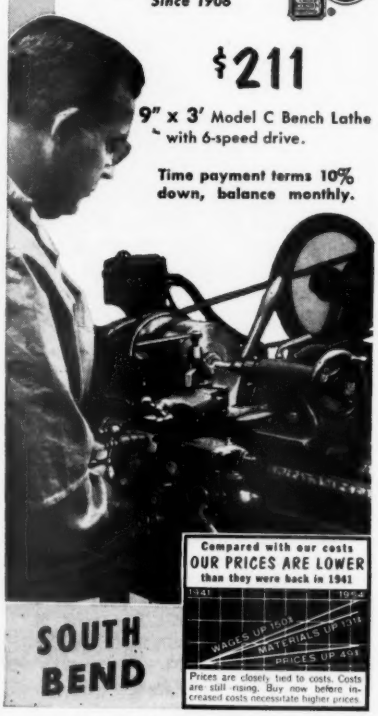
South Bend

BEST FOR BETTER METALWORKING

The superiority of South Bend's popular 9" Bench Lathes has been proved by their performance in all types of shops. From the smallest job shops to the largest of industrial machine shops, men who know will tell you that you get more for your money in South Bend precision tools.

South Bend Lathes are built to retain their accuracy through many years of service. Ruggedly constructed from the finest of materials by highly skilled workmen, they will give you the same dependable service that is responsible for their enviable world-wide reputation. Made in a variety of models with between-centers capacities from 16 to 34 in. *Write for catalog.*

SOUTH BEND LATHE
SOUTH BEND 22, INDIANA
Building Better Tools Since 1906



$211
9" x 3' Model C Bench Lathe with 6-speed drive.

Time payment terms 10% down, balance monthly.

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941
1941
1964
WAGES UP 150%
MATERIALS UP 131%
PRICES UP 45%
Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

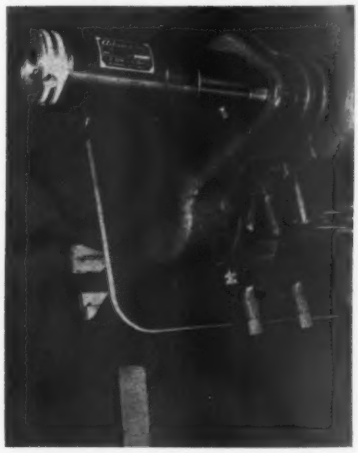
SOUTH BEND

CIRCLE INFORM-A-GRAM KEY NO. 1222

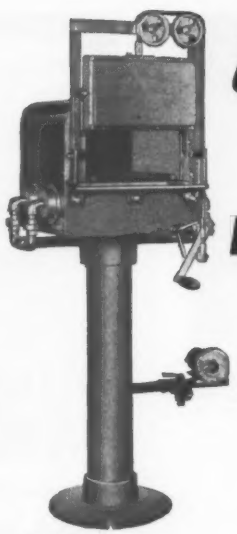
A Universal Vernier Bevel Protractor with a dull chrome finish over the entire measuring dial is announced by the George Scherr Co., 200 Lafayette St., New York 13, N.Y. This finish eliminates all glare and

makes measurements easy to read. It also protects the surface from rust and corrosion. An illustrated circular with detailed instructions on how to read the instrument and showing a number of typical applications is available.
Circle Inform-A-Gram No. A23.

An Air Operated Collet Closer has been developed for 1⅜" or smaller hollow-spindle lathes using either internal or external collets with maximum 1" bar stock capacity. This closer insures fast, positive opening and closing by power. The new collet is designed for spindle speeds up to 4500 rpm. Action of



the closer is produced by an air operating piston working on a cam and dog action. By controlled hand adjustment, draw bar pull can be instantly changed from zero to 5000 lbs. without changing air pressure. Literature may be obtained by writing to I. W. Adams and Associates, 4200 Burbank Blvd., Burbank, Calif.
Circle Inform-A-Gram No. A24.



Quick Acting
JOHNSON
No. 142
Hi-Speed Furnace

SAVE HOURS
CUT
HEAT TREATING COSTS

Save time, save gas . . . heat treat carbon and high speed steels, dies and tools with JOHNSON 142. Powerful burners provide fast, uniform heat. Gets the job done while other furnaces are still warming up. Temperatures easily regulated. Firebox 7" x 13" x 16½" lined with high temperature refractory. Complete with Carbofrax Hearth, G. E. Motor and Johnson Blower.

For temperature range 1400° to 2350° F....$325.00
For temperature range 1800° to 2400° F....$355.00

F.O.B. Factory
Models available in smaller firebox sizes.
Write for Free Catalog.

JOHNSON GAS APPLIANCE CO.
575 E Ave. N.W., Cedar Rapids, Iowa

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Since 1901
FURNACES FOR INDUSTRY

CIRCLE INFORM-A-GRAM KEY NO. 1231

PRECISE
hole location,
easy contour
inspection with
new machine
tool microscope

Any machine shop, large or small, can save time and money on milling and boring work with the new Perkin-Elmer Model 11 Machine Tool Microscope. For hole location, its wide field of view (¼") or 30x magnification makes it possible to gage accurately to a ten thousandth—*at a glance.*

Mount the Model 11 on an offset bracket or directly in the spindle—it will fit nearly any machine tool. When offset it can be used for transferring hole locations from template to workpiece. The image always appears erect and moves in the same direction as the work, making it ideal for checking contours, slots, surface conditions. The Model 11 Microscope is compact, sturdy, rugged—designed for long life, accurate service.

Write today for complete details.

THE PERKIN-ELMER CORPORATION NORWALK, CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 1232

Durably made of quality stock . . . simple and easy to attach . . . can be fitted to any die in 10 to 15 minutes. Adaptable to blanking, progressive or compound dies and can be used on strippers 5/16 inch thick and up. Works well on either right or left hand feeds—or with light or heavy material. Provides long, trouble-free performance.

Pays for itself after a few short runs

Automatic Stop individually packed with Trip Spring and Mounting Screws..... $2.50 each

Primary Stop..... $6.00 doz.

(Discount for quantity orders)

Automatic Stop				
Cat. No.	A	B	C	D
9-11-6	5/16"	5"	5/8"	3"
9-21-6	1/4"	6"	3/4"	4"

Specify right or left hand

Primary Stop			
Cat. No.	A	B	C
9-31-6	1/16"	3/8"	2 3/4"
9-41-6	3/32"	3/8"	2 3/8"
9-51-6	1/8"	3/8"	2 3/8"

For immediate delivery, specify size and mail orders to

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue, Chicago 50, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1241

WORK MATES TO MORE EFFICIENT PRECISION CRAFTSMANSHIP

CHALLENGE

SURFACE PLATE EQUIPMENT

• HIGH GRADE SEMI-STEEL • HEAT TREATED • PRECISION GROUND

STRAIGHT EDGES—For scraping planer and lathe bed ways . . . parallel straight edges for inspection of alignment and bearing surfaces of machine tools.

UNIVERSAL BOX ANGLES Combines the clamping facilities of an angle iron, the stable accuracy of a box parallel with the perpendicular flat surface of an angle plate.

ANGLE PLATES—Made in 22 sizes from 2 3/4 x 4 3/4 x 4 3/4 up to 24 x 24 x 24 for clamping and holding work.

V-BLOCKS—Feature ribbed sides, light weight and a V accuracy of .0005 inch . . . for supporting shafts for drilling, checking, etc.

BOX PARALLELS Complete range of sizes for every use . . . Accurate to .0005 inch.

THE CHALLENGE MACHINERY CO.

Office, Factories and Show Room: Grand Haven, Mich.

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DEALERS IN ALL PRINC.PAL CITIES

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To CUT KEYWAY CUTTING COST...

Cut this Coupon

du MONT *Minute Man* KEYWAY BROACH KITS and an arbor press are all you need to cut any keyway from 1/16" to 1" in any bore from 1/4" to 3" — *by hand, in one minute* for as little as *one cent* per keyway

The du MONT CORPORATION, Greenfield, Mass.

MAIL FREE KEYWAY BROACH CATALOG and PRICE LIST TP to

Name.....

Company.....

Address.....

CIRCLE INFORM-A-GRAM KEY NO. 1243

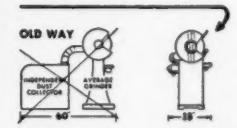
Hammond of KALAMAZOO

2 IN 1

NO-DUST GRINDER

SAVE OVER 50% FLOOR SPACE THE HAMMOND WAY

OLD WAY



DUST-LADEN AIR IS A MENACE!

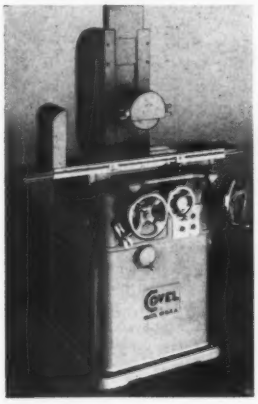
- Protect your employees' health.
- Protect nearby machine tools from dust and grit.
- Save floor space — requires only 6½ square feet. For 10", 12", and 14" wheels. Write for Catalog.

Hammond Machinery Builders Inc.

1631 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN

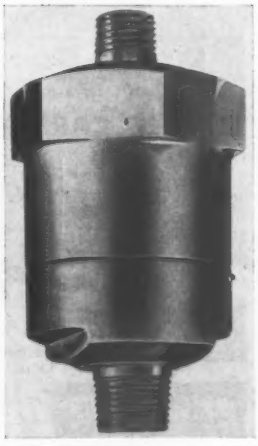
CIRCLE INFORM-A-GRAM KEY NO. 1244

Coordinate Comparator. This instrument reads direct to 0.001 mm in both coordinates and is designed for the measurement and evaluation of photographic records within its range, which would include such records as guided missile tracking plates, x-ray plates, charged particle tracking plates and spectrograms. It also can be used as an instrument for inspection and measurement of small mechanical parts. Further information is contained in Bulletin 169-54, which can be had from the Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14, Ill.
Inform-A-Gram No. A25.



A Precision Surface Grinder, designed for gage and form tool work, as well as surface grinding, has been introduced by the Covel Mfg. Co., Benton Harbor, Mich. This reciprocating table model is available with hand or mechanical feed. It will grind work 6" x 18" x 15" high under a 7" grinding wheel driven by a 1 hp motor driven spindle. For complete information on this rugged, economical machine, write to the company for Bulletin No. 10-54, or—
Inform-A-Gram No. A26.

Compressed Air Systems may now be drained of condensation automatically in the course of closing down between shifts or overnight. A low pressure unit designed by Wilkerson Corp., 3395 S. Platte R. Dr., Englewood, Colo., drains air lines, aftercoolers, etc. and opens when pressure drops past 10 lbs., allowing all moisture to be blown out before the line pressure reaches zero. When pressure begins to build up again in the system, the drain unit closes, or resets, as the pressure rises past 10 lbs.
Inform-A-Gram No. A27.



A Double-Barrel Crossarm Assembly for use with all column-type Electro Arc metal disintegrators, old or new, where accurate work and frequent changes in setup are required, is now available. This assembly provides extra-rigid support for the operating head; easy transverse adjustment, independent of angular settings; independent angular adjustments in the horizontal and vertical planes; easy duplication of setup; and automatic gravity feed of the operating head. Full details are given in Bulletin 543, which can be had upon request from the Electro Arc Mfg. Co., P. O. Box 448, Ann Arbor, Mich. Write direct to the company, or— **Inform-A-Gram No. A28.**

HIGHER SPEEDS!
FASTER GRINDING!

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AIR GRINDERS

Model JA
50,000 R.P.M.
$42.00
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

. The RPM's stay up while grinding . . . not only when the grinder runs idle. That means better work—longer wheel life.

High speed grinding with small wheels was a Madison-Kipp development of the late twenties. It was born out of a pressing need in our tool room. Because tool room grinding problems are universal, we believe it will pay you to utilize Kipp grinders in your tool room as generally as we do in our own.

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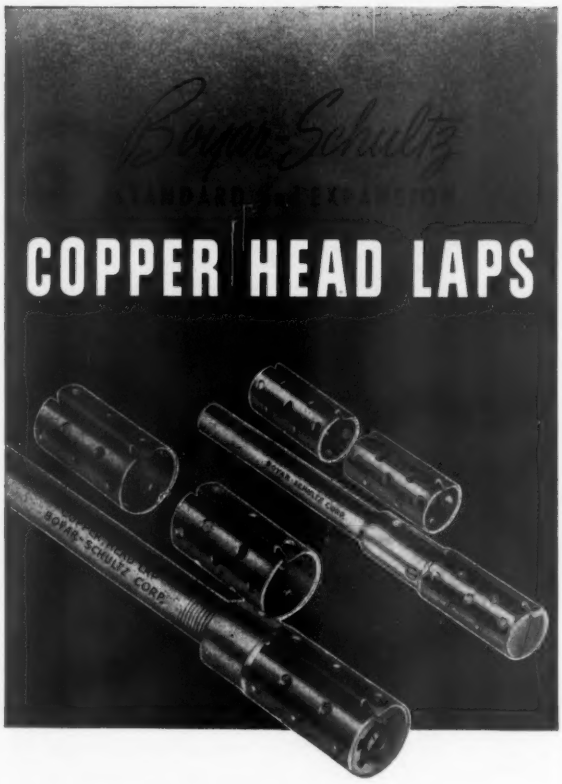
212 Waubesa St. • Madison 10, Wis., U.S.A.
CIRCLE INFORM-A-GRAM KEY NO. 1251



BOYAR-SCHULTZ COPPER HEAD LAPS are accurate, fast working and easy to use. They are much less costly than making laps in your own tool room. Because the only wearing part is the inexpensive copper sleeve, they are long lasting.

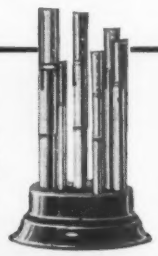
Unlike laps made for specific jobs, they are used over and over again, changing only the sleeves. Adjustment permits correct lapping size to be maintained till sleeve is worn out and replaced with a new one. Thus, with Boyar-Schultz Copper Head Laps you save tool room time and get accurate speedy lapping.

Copper Head Laps and Sleeves are immediately available from stock, in standard sizes—1/8" to 2½" diameters.

Write for circular

SPECIAL TOOL MAKERS BENCH LAP SETS

A time saving set in Tool & Die work. Set consists of seven most commonly used sizes - 1/8" - 3/16" - 1/4" - 5/16" - 3/8" - 7/16" - 1/2", with enameled die cast base.

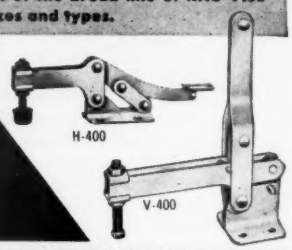


BOYAR-SCHULTZ CORPORATION
2012 So. 25th Avenue Dept. D-L
BROADVIEW (Chicago) ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1261

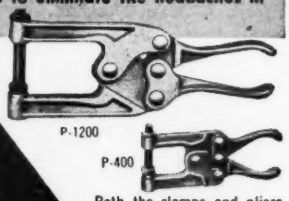
TOGGLE CLAMPS With added valuable feature — now offered to you as part of the broad line of KNU-VISE Toggle Clamps—in many sizes and types.

they're NON-CORROSIVE!
they're NON-MAGNETIC!
they're of STAINLESS STEEL!



TOGGLE PLIERS Here is the KNU-VISE answer to your need for a portable clamp to eliminate the headaches in spot welding aluminum.

they're NON-MAGNETIC!
they're NON-CORROSIVE!
they're of K-MONEL! (stronger than steel)



Both the clamps and pliers are also available in aluminum, on special request.

Sales offices in principal cities—Teletype DE 49

KNU-VISE PRODUCTS **LAPEER MFG. CO.**

3064 DAVISON ROAD • LAPEER, MICHIGAN
WESTERN DIVISION: 422 MAGNOLIA, GLENDALE, CALIF.
CANADIAN DIVISION: HIGGINSON ENGINEERING, HAMILTON, ONT.

CIRCLE INFORM-A-GRAM KEY NO. 1262

NEED CARBIDE-TIPPED REAMERS *in a hurry?*

***Staples* can give —**

48-HOUR DELIVERY on special reamers that are slight alterations of standard sizes

IMMEDIATE DELIVERY on standard sizes of expansion reamers—and solid reamers with straight and spiral flutes

Phone, wire or write for complete information!

Standardize on Staples Carbide-Tipped Circular Tools—you'll get longer tool life, greater accuracy, and spend less time on tool servicing. Staples is the *quality* name in carbide tool production. If you require special tools, Staples welcomes the opportunity to help you get the utmost in precision hole production. Tell us your requirements.

THE STAPLES TOOL COMPANY • Cincinnati 25, Ohio

Staples **CARBIDE-TIPPED CUTTING TOOLS**

A complete line of Circular Carbide-Tipped Tools, Expansion Reamers—Special Tools

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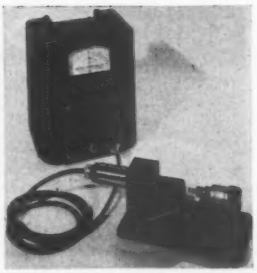
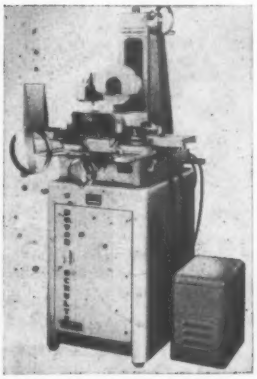


This Electronic Micrometer Reads to 0.00001" at magnification of 18,000 times. The tool is particularly adapted for measuring fine magnet wire, small screw machine parts, pivots, etc. It is made by Brown & Sharpe Mfg. Co., Providence, R. I. Further data is available.
Inform-A-Gram No. A29.

A New 30" Single Wheel Wet Tool Grinder, with a compact, well proportioned design that features vibrationless operation, has been developed by The Standard Electrical Tool Co., Mt. Hope & Sixth St., Cincinnati 4, Ohio. The grinder has a two-speed multiple V-belt drive with 5 hp motor. **Inform-A-Gram No. A30.**

Typical of Air-Operated Tools used in the shop, this photo shows a screwdriver being connected to the air hose quickly and easily with the new Roylyn 1800 Series pneumatic coupling and connector. The coupling was designed by Roylyn Inc., 1706 Standard Ave., Glendale 1, Calif., to fully meet the demand by industry for a "quick" coupling with fast, safe and sure performance. **Circle No. A31.**

Automatic Flow Control. To provide automatic "on and off" control of flow (water or air), a new piston-type, pilot action solenoid operated valve of modern design has been developed by the Hays Mfg. Co., 814 West 12th St., Erie, Pa. The valve is built of noncorrosive parts and is packless in construction. It permits flow only during the required periods and is available in ⅜", ¾", and 1¼" pipe sizes. **No. A32.**



Hydraulic Longitudinal Action is now available with Boyar-Schultz 6 x 12 surface grinders. A new hydraulic valve, designed by Boyar-Schultz engineers, affords perfect reciprocating movement. The machines can be changed from hydraulic to hand feed and return in a few seconds. Complete information on the new grinder is available from the Boyar-Schultz Corp., 2110 Walnut St., Chicago 12, Ill. Write direct to the company, or—**No. A33.**

JIG GRINDING ACCURACY *guaranteed**

INFINITE CONTROLLED SPEEDS 30,000 TO 65,000 R. P. M.

Easily connect jig grinder to jig borer or mill

Then you can finish grind in hardened steel to "tenths" . . . jig grind dowel holes square with a ground base . . . move location of holes in hardened steel blocks . . . jig grind interchangeable holes in hardened sections . . . grind small holes with diamond impregnated mandrels . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . eliminate jig bushings in tools where close spacing is essential.

Other infinitely controlled air driven spindle applications

Place spindle on most any machine. Use it for finishing contours on hardened steel working surfaces . . . burring or milling die castings . . . routing wood contours . . . carbide milling or finishing slots . . . finishing holes in hardened steel to "tenths" . . . grinding with diamond wheels, carbide burrs, or diamond impregnated mandrels.

Advantages—10 micro finishes using carbide mills . . . 6 micro finishes using mounted points, operates at any angle . . . air driven, air cooled, overheating prevented . . . speed controlled at optimum point . . . 3¼" long motor uses little working space . . . By controlling speed at any point you abolish need for many constant speed spindles.

For immediate quotation please state machine tool application. Get this manual of photos showing operations Vulcanaire performs.

*Dependably accurate to "tenths"

Vulcanaire
It's built by toolmakers for toolmakers

MAJOR VULCAN SERVICES

Engineering, Processing, Designing and Building, Special Tools . . . Dies . . . Special Machines . . . including the *Vulcan Hydraulics that Form, Pierce, Assemble and Size.*

VULCAN TOOL CO.

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CIRCLE INFORM-A-GRAM KEY NO. 1271

Notch 12 PIPE ENDS per MINUTE

Makes PERFECT JOINTS FOR WELDING OR BRAZING!

ARC-FIT
REG. U.S. PAT. OFF.

NOTCHES CLEAN NO FINISHING...

Standard ARC-FIT in hand or power press shears contours for "T" joints for ½" to 2" pipe or tubing with easily interchanged dies.

Special ARC-FITS for larger sizes, angles other than 90°, slotting or notching square pipes, angle iron or flat stock.

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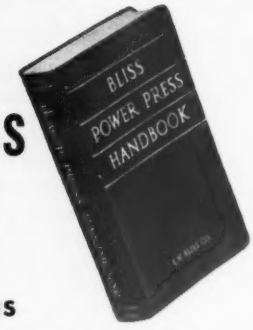
ACME GAGE

CIRCLE INFORM-A-GRAM KEY NO. 1281

THE BLISS
POWER PRESS HANDBOOK

700 PAGES
400 ILLUSTRATIONS



Need a hand with press problems? Reach for the Bliss Power Press Handbook—more than 10,000 others already have. It's a handy and authoritative reference of data for engineers, production executives and trainees.

Sections cover press job computations • proper die selection • engineering tables • die illustrations • service instructions for Bliss presses • complete glossary • and an index. "One or several are needed in every stamping shop," says *American Machinist*.

Its soft cover, black Morocco binding and gold lettering make the handbook a handsome addition to any technical library. So order your copy today... and one for the shop. $7.50 each. Use the handy coupon below.

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CIRCLE INFORM-A-GRAM KEY NO. 1283

SHOP TOOL for measuring surface roughness..

The PROFILOMETER

The Profilometer measures the roughness of practically ALL surfaces, internal and external, in microinches (arithmetical or r.m.s. average). It's rugged, portable, and simple to use; no experience needed. Used in thousands of production departments — *at the machines.* Sold and serviced by *specialists* in surface measurement . . . since 1936.

FREE BULLETIN LT89 gives details; shows typical applications. Write!

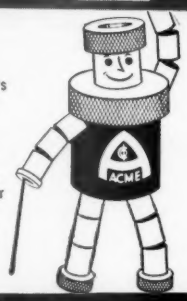
Profilometer is a registered trade mark.

MC Co MICROMETRICAL MANUFACTURING COMPANY
345 S. MAIN ST. ANN ARBOR 14, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1282

Carry Your Inspection to the Machine with Acme's New Portable
BENCH CENTERS
ONLY 18" OVERALL • WEIGHT ONLY 19½ LBS.

Use Magnetic or Standard Indicators Directly on the Bed Area
•
Easily sets on Angle Plates for Vertical or Angular Checks
•
Fits any 12" Surface Plate



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Full or Cut Down
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Save Time and Money
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Avoid Rejects
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Speed Production
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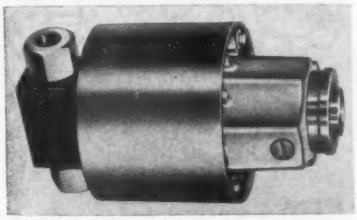
CHICAGO 7, ILLINOIS

Chamfer Micrometer Gages • Hardened and Ground Precision Parts • Flat Lapping

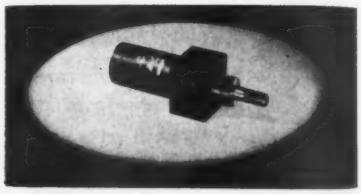
CIRCLE INFORM-A-GRAM KEY NO. 1284

Hydraulic Boost Pump. Development of a new, air-operated hydraulic boost pump which features an automatic, pilot-operated air selector valve to eliminate stalling, has been announced by the Southern



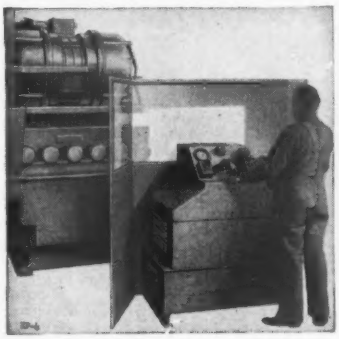
California Hydraulic Engineering Corp., 6318 S. Central Ave., Los Angeles 1, Calif. Fluid output capacities of this unit range from 2½ gallons per minute at 1000 psi to 8 cu. in. per minute at 30,000 psi.
Circle Inform-A-Gram No. A34.

Clamp-Type Cylinder. A new, inexpensive clamp-type air or hydraulic cylinder has been designed by Carter Controls, Inc., 2800 Bernice Rd., Lansing, Ill. The new cylinder is applicable to many different uses



in many different kinds of plants. Among the applications are those in connection with toggle operations, spring return motions, die set strippers, pilot operation of valves, opening of die sets, multiple holding and clamping operations, and jigs and fixtures. Further data is available.
Circle Inform-A-Gram No. A35.

For Friction Saws. The latest type hydraulic power unit for push-button control of Kling Friction saws is of the semi-automatic feed control type. The touch of a finger



on one of the buttons starts or stops the travel of the work or controls the carriage speed to any desired degree. Copies of a bulletin explaining all can be obtained from Kling Bros. Engineering Works, 1320 N. Kostner Ave., Chicago 51, Ill.
Circle Inform-A-Gram No. A36.

Photos courtesy Ford Motor Company, Detroit Macoid Company.

DE·STA·CO HELPS PUT SKYLIGHT IN THIS CAR

Eleven Model 210 TU De·Sta·Co Toggle Clamps position and hold hot plastic sheets during the vacuum molding process used to produce transparent car roofs for Ford and Mercury automobiles. This fixture requires positive holding pressures during the 10 minute draw of Plexiglass sheet heated to 300° F. Two-second engagement and release of the De·Sta·Co Toggle Clamps speeds production, assures accuracy.

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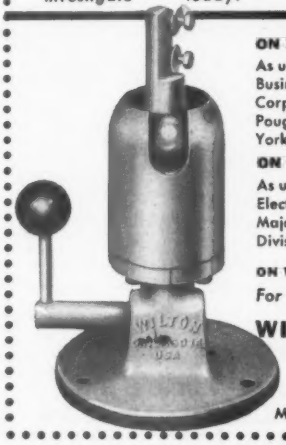

Model No. 301

ON MACHINES
As used by International Business Machines Corporation, Poughkeepsie, New York, plant.

ON CONVEYORS
As used by General Electric Company's Major Appliance Division, Erie Works.

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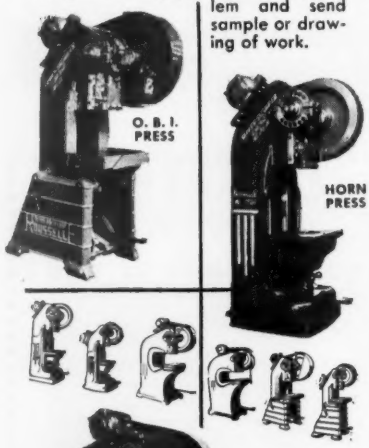
YOU'LL LIKE THE PRICE—when you get our quotation and compare specifications and quality. So let our engineering staff assist you—often they can suggest worthwhile savings—no obligation. Simply explain the problem and send sample or drawing of work.



Rousselle Presses are Sold Exclusively through Leading Machinery Dealers

ROUSSELLE PRESSES

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CIRCLE INFORM-A-GRAM KEY NO. 1301

This Power House Air Press (bench type), assembles, bends, straightens, punches, stamps, trims, rivets, broaches, crimps, and swages. It is

extremely well suited for continuous heavy use in production, assembly and maintenance work. Literature on the press is available from the Van Products Co., 3778 W. 12 St., Erie, Pa.

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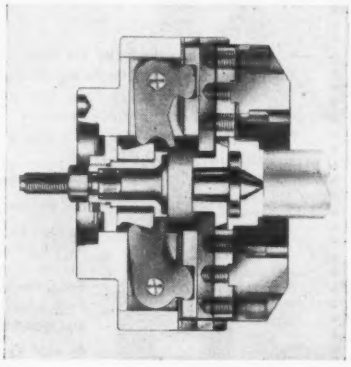
A New Compensating Chuck is designed to hold rough forgings, out-of-round castings or finished pieces with irregular grasping surfaces, and at the same time provide the maximum amount of equal gripping pressure on each jaw. The chuck body is of one-piece steel casting or special



aluminum forging. All working parts are made of heat treated alloy steels for strength and durability and are precision finished to close tolerances. A solid center for easy removal is furnished with each chuck. Further data is available from the S-P Mfg. Corp., 12415 Euclid Ave., Cleveland 6, Ohio.

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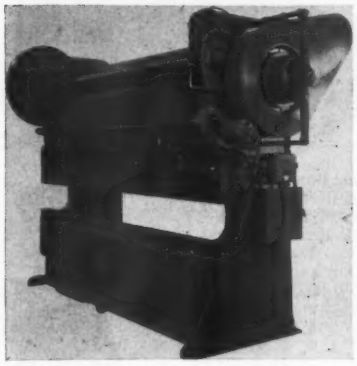
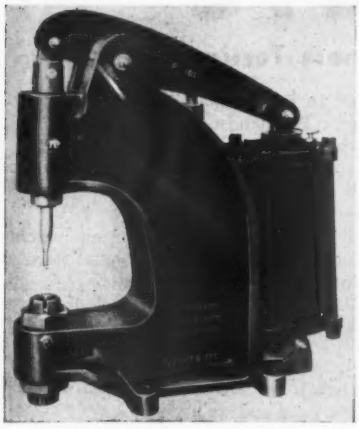
Here Is A New High-Speed, All Steel Press Brake which can be used for high speed punching and automatic feeding applications. It operates at 70 strokes per minute and is equipped with a specially arranged ram. The machine has an all steel rolled plate construction with an in-



terlocked frame, push button control to the ram adjustment, micrometer indicators on both ends of the machine, centerline loading, weld-free joints, and automatic pressure lubrication. Additional features include the planing of a double hook tongue in the ram with the bed member doweled to the housings to withstand a 20-ton stripping load. The press brake is a product of the Cincinnati Shaper Co., Hopple, Garrad & Elam Sts., Cincinnati 25, Ohio.
Circle Inform-A-Gram No. A39.

A New Air-Powered, Bench Model Riveter that will clinch up to ¼" tubular steel rivets is now being manufactured by Robinson Products, Inc., 16550 Wyoming Ave., Detroit 21, Mich. Designed for sustained use, this riveter has a rugged air cyl-



inder that delivers over 2 tons of pressure, taking a maximum of 150 psi from normal air supply lines. With a full 1" stroke, this machine (which weighs only 60 lbs.) may also be used for stapling, light punching, knocking out rivets, etc.
Circle Inform-A-Gram No. A40.

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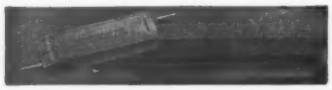

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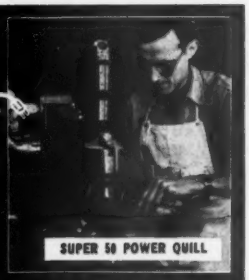

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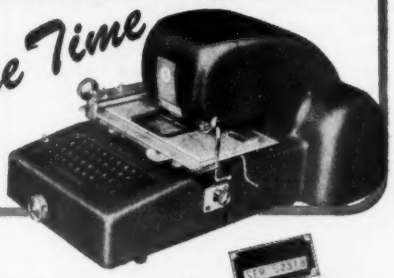
How To

Mark Name Plates In

1/5 the Time



Cutting costs in these times is a good trick if you can do it. You can, on plates requiring detail marking, by using an Automark Electric Metal-Marking Typewriter. The operator lightly touches the key and the Automark does the rest, quickly and automatically. No dial to turn—no lever to pull. Marking output is increased five times and worker fatigue is greatly reduced. Write today for Bulletin 8-16.

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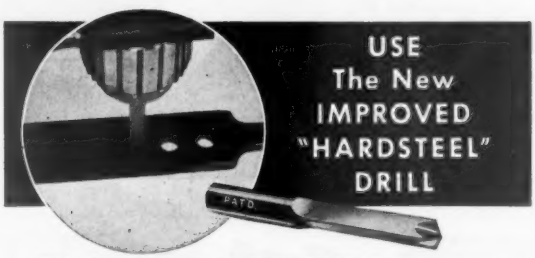
Drill Hardened Steels without Annealing –



With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon—high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

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Also makers of— BLACK DRILLING UNITS—AUTOMATIC, SELF-CONTAINED—FOR COST-CUTTING PRODUCTION ON ALL MATERIALS *Write for information*

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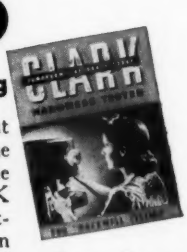
About Hardness Testing



Everything you need to know about hardness testing is told in this handsome book, prepared by the makers of the internationally respected CLARK Hardness Testers for "Rockwell Testing." Simple, easy-to-read text (in English) and numerous illustrations show the equipment and procedure for fast, accurate hardness testing of ferrous and non-ferrous materials. If you would like a copy, *free of charge*, just attach this ad to your letterhead or write "Send book." A copy will be mailed to you promptly.

P.S. If you are interested in descriptions and prices for CLARK Hardness Testers (Standard and Superficial) of *guaranteed accuracy*, say the word and we'll gladly supply them.

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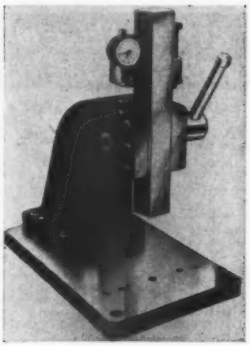
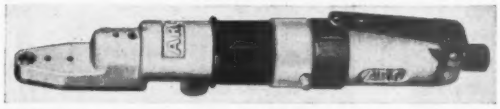


Here Is A "Micro" Press for precision assembling, piercing, broaching, forming, press fits, and burnishing operations that require perfect line-up and controlled depth. This new precision bench tool is manufactured by the Queens Tool Engineering & Mfg. Co., 15 Front St., Rockville Centre, Long Island, N. Y. Complete details, including specifications can be had by writing direct to the company, or— **Circle No. A41.**

Flat Angle Drill. A new flat angle drill, incorporating features which improve space-saving and ruggedness has been anounced by The Aro Equipment Corp., Bryan, Ohio. Head height of this new air-powered drill is only



43/64". The tool has 5/16" spindle off-set and an overall length of 10-5/16" for Model 7438. Greatly improved facility for drilling in close quarters or on hard-to-reach work results from this development of a completely new and different design of gears and housing. Further information will be sent upon request.
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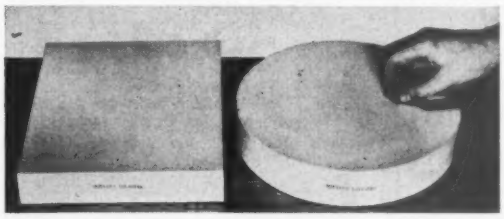
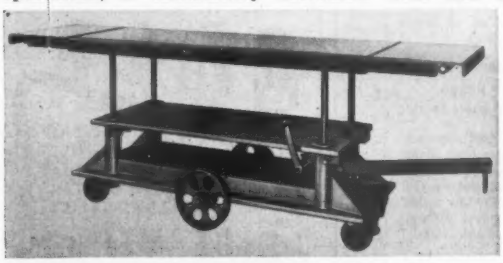
Parts May Be Lapped on this fixed abrasive lapping and polishing stone immediately after surface grinding or fine machine finishing. A 2 micro-inch finish is quickly attained on hardened steels as well as soft metals, al-

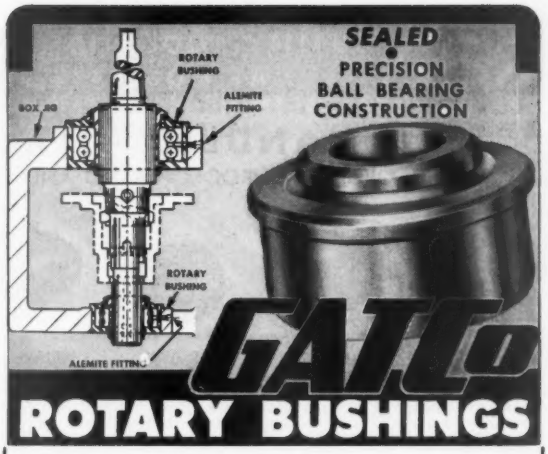


loys and carbons. Stock removed will not load the stone, but is easily wiped away with an oil wetted cloth. This stone does not lose its flatness readily and, when necessary, is easily reconditioned in your own shop. It is available through Abrasive Engineers, 245 Waukegan Ave., Highwood, Ill.
Circle Inform-A-Gram No. A43.

The Ease of Handling Narrow Sheet or Strip Metal from storage, and at and between a series of machine operations, is measurably increased with this Port-



elvator (R). The capacity load of 5000 lbs. is quickly and easily moved from "low" to "high" position. The Hamilton Tool Co., 832 S. Ninth St., Hamilton, Ohio, offers its Bulletin No. PS-54 which gives complete details.
Circle Inform-A-Gram No. A44.



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These are designed for machine tools, jigs, fixtures, shift lever handles, etc. and give your product that "dressed up" appearance. Made in a wide variety of diameters and thread sizes. Steel ball handles are turned from bar stock. Highly polished. Low prices and the finest quality.

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The DI-PROFILER is a new triple action tool that
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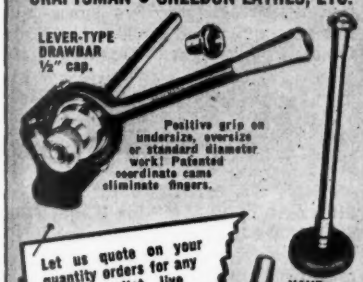
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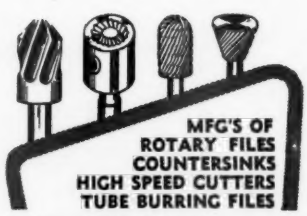

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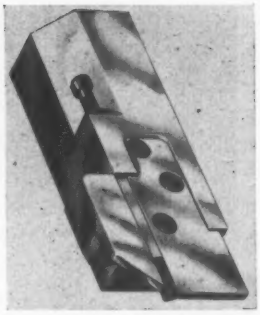
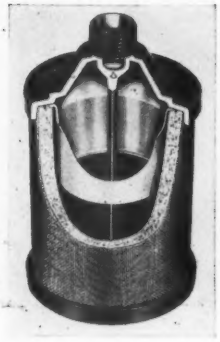
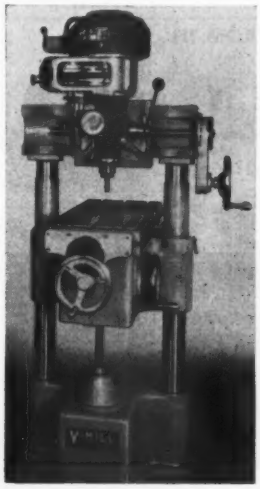
Cut-Off Tool. This newly designed clamp-on tool for cut-off work is an answer to faster, more economical carbide cutting. A patented "V" blade support assures accurate location of the carbide cutting insert. Literature and specifications are available from the Portage Double Quick Tool Co., 1046 Sweitzer Ave., Akron 11, Ohio.
Inform-A-Gram No. A45.





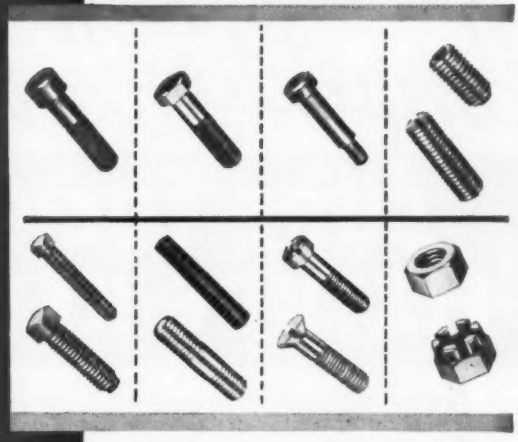
Exhaust Muffler. A new "HC" model air exhaust muffler designed to eliminate a major source of noise caused by velocity discharge from air-actuated devices has been introduced by the Allied Witan Co., 4315 W. 138th St., Cleveland 11, Ohio. This muffler is available in sizes ranging from ⅛" to 2" standard pipe size. The design characteristics do not restrict full volume air flow maintaining absolute minimum back pressure. **Circle No. A46.**

Air & Hydraulic Valves. An improved design of its high performance "Hi-Cyclic" single and double solenoid air and hydraulic valves has been announced by the Beckett-Harcum Co., 1087 Wayne Rd., Wilmington, Ohio. The design improvements include nylon end thrust bushings for positive valve piston location and quick disconnect electrical connections, which permit removal of the solenoid coil without disturbing the electrical circuit. Complete details are available in the company's Bulletin No. 60. **Circle No. A47.**



Exceptional Precision, range and ease of operation together with high capacity and low cost are among the many advantages of the new Pierce-West V-Mill which will be distributed nationally by Lodding, Inc. The machine was specifically designed to perform a wide range of milling, boring and drilling operations efficiently. It is made to receive as large a workpiece as possible within a practical floor area of 31" x 60". Complete information can be obtained by writing to Lodding, Inc., Dept. N82, 79 Beacon St., Worcester, Mass., or, —
Inform-A-Gram No. A48.

Cut Assembly and Production Costs with "CHICAGO" Standard Threaded Products



For whatever purpose, production or maintenance, "Chicago" Threaded Products for 82 years have been precision made to assemble faster with less "on the job" trouble.

Specify standard sizes for faster deliveries, greater savings over "specials" and less downtime. Our more complete stocks mean "at once" shipments when you need them—no production delays—no maintenance "shut downs"—no large inventories necessary.

The "Chicago" line of threaded products is a complete line, available from the stocks of your service-conscious Industrial Supply dealer—in bulk or in packages for original equipment or replacement. Ask him for samples—he will gladly supply them.

This new 36-page catalog tells the whole story of the "Chicago" complete line of threaded products. Ask for your copy today.

All "Chicago" Screw Products come packed in strong, easier-to-see packages. Color coded labels mean faster selection, greater savings of time in your stockrooms.

HIGHLIGHTS OF THE "CHICAGO" LINE:

★ High Carbon Heat Treated Cap Screws give added wearing qualities due to uniform hardness through entire thread structure. Ideal for all heavy-duty equipment.

★ Larger size Hexagon Head Cap Screws than normally stocked are available for immediate shipment.

★ Anti-corrosive "Chicago" stainless steel and brass fasteners in a large range of sizes and styles available for immediate shipment.

The CHICAGO SCREW COMPANY
2519 W. Washington Boulevard
Bellwood, Illinois

"SAFETY PLUS" Socket Set Screws, alloy and stainless • Socket Head Cap Screws, alloy and stainless, Flat Head, alloy • Socket Head Stripper Bolts • Socket Pipe Plugs • Square Head Dog Point Set Screws • Socket Keys and Key Kits • "CHICAGO" Hexagon Head Cap Screws, bright, heat treated, stainless and brass • Square Head and Headless Set Screws • Fillister and Flat Head Cap Screws • Milled Steel Studs • Hexagon Nuts, steel and brass • Castle Nuts • Taper Pins

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2 Milled keyways at prevailing shop rates	$15.00
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Old Fashioned Cost Method	$19.62
New SURE LOCK Method	9.70
SAVING	$ 9.92

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SURE LOCK—the new, exclusive development in fixture keys, is meeting with wide success throughout the country. Some manufacturers are ordering them by the hundreds because...every fixture is immediately available to every machine regardless of T slot or size.

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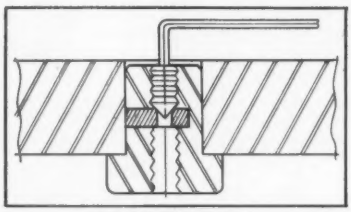
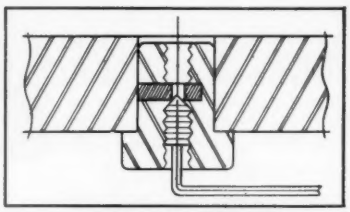


FROM THE TOP



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4	18	32	77	91	1042	1163	1213	1281	1323	1412	1453	1491	1522	1572	1606
5	19	33	78	92	1043	1164	1221	1282	1324	1413	1461	1492	1523	1573	1607
6	20	34	79	94	1051	1171	1222	1283	1331	1414	1462	1493	1524	1581	1611
7	21	35	80	95	1052	1181	1231	1284	1341	1421	1463	1501	1525	1582	1612
8	22	36	81	96	1061	1182	1232	1291	1342	1422	1471	1502	1526	1583	1613
9	23	39	82	97	1071	1183	1241	1292	1343	1423	1472	1503	1531	1584	1614
10	24	40	83	98	1081	1184	1242	1301	1344	1424	1473	1504	1532	1591	1615
11	25	41	84	99	1091	1191	1243	1302	1345	1431	1474	1505	1533	1592	1631
12	26	42	85	100	1101	1201	1244	1303	1346	1441	1481	1506	1534	1593	1641
13	27	63	86	101	1111	1202	1251	1311	1351	1442	1482	1511	1541	1601	
14	28	71	87	1031	1121	1203	1261	1312	1361	1443	1483	1512	1542	1602	

EDITORIAL ITEMS

A1	A15	A29	A43	B9	B23	B37	B51	B65	C4
A2	A16	A30	A44	B10	B24	B38	B52	B66	C5
A3	A17	A31	A45	B11	B25	B39	B53	B67	C6
A4	A18	A32	A46	B12	B26	B40	B54	B68	C7
A5	A19	A33	A47	B13	B27	B41	B55	B69	C8
A6	A20	A34	A48	B14	B28	B42	B56	B70	D1
A7	A21	A35	B1	B15	B29	B43	B57	B71	D2
A8	A22	A36	B2	B16	B30	B44	B58	B72	D3
A9	A23	A37	B3	B17	B31	B45	B59	B73	
A10	A24	A38	B4	B18	B32	B46	B60	B74	
A11	A25	A39	B5	B19	B33	B47	B61	B75	
A12	A26	A40	B6	B20	B34	B48	B62	C1	
A13	A27	A41	B7	B21	B35	B49	B63	C2	
A14	A28	A42	B8	B22	B36	B50	B64	C3	

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9	23	39	82	97	1071	1183	1241	1292	1343	1423	1472	1503	1531	1584	1614
10	24	40	83	98	1081	1184	1242	1301	1344	1424	1473	1504	1532	1591	1615
11	25	41	84	99	1091	1191	1243	1302	1345	1431	1474	1505	1533	1592	1631
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A6	A20	A34	A48	B14	B28	B42	B56	B70	D1
A7	A21	A35	B1	B15	B29	B43	B57	B71	D2
A8	A22	A36	B2	B16	B30	B44	B58	B72	D3
A9	A23	A37	B3	B17	B31	B45	B59	B73	
A10	A24	A38	B4	B18	B32	B46	B60	B74	
A11	A25	A39	B5	B19	B33	B47	B61	B75	
A12	A26	A40	B6	B20	B34	B48	B62	C1	
A13	A27	A41	B7	B21	B35	B49	B63	C2	
A14	A28	A42	B8	B22	B36	B50	B64	C3	

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Special Machine Trims Compound Contoured Parts

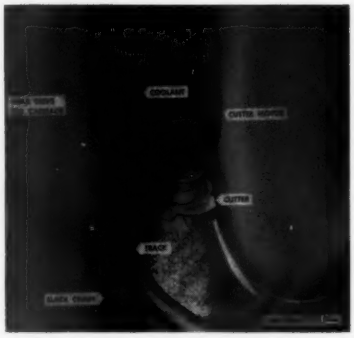
Manufacturers often are faced with a fabricating problem that requires a special or single-purpose machine like nothing else on the market. In these cases the manufacturer can utilize outside design and construction services; or, if he is well-equipped with the necessary ingenuity, he can have the machine designed and built within his own plant.

The process used by Pastushin Aviation Corp., Los Angles, to form compound-contoured fuel

tank halves (0.072″ gauge, 61St aluminum alloy, 25″ O.D. and 80″ long) leaves a flange in an elliptical, horizontal plane which must be removed before the sections can be seam-welded.

Faced with the problem of trimming these flanges, the company's engineers designed and constructed a unique trimming machine.

The large warped skin area of 2400 sq. in. presented a major problem in holding the part during trimming. The machine solves this problem by securing the formed blank with 24,000 lbs.



of vacuum holding force uniformly distributed over the surface while a portable self-contained cutter, guided by tracks, skirts the elliptical periphery of the flange, trimming as it moves.

The machine consists of a structural base, a skeleton holding frame, and a portable carriage. In the base is a coolant tank, a reservoir for storage vacuum, and a chip collector. Working like an accumulator in reverse, a Roots vacuum pump pulls air from the storage vacuum chamber and discharges it through an industrial muffler to reduce the noise level.

Atop the structural base rests a deck containing a track for the cutter carriage and the skeleton

. . . Continued on page 143

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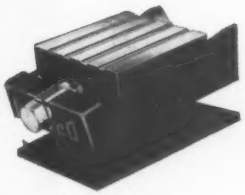
SAVE TIME SETTING UP AND LEVELING YOUR MACHINES WITH FAST, ACCURATE, SELF-ALIGNING LEVELERS!



Style JD Wedge type

You can meet hurry up demands for relocation of machinery quickly and easily with improved EMPCO JACKS. You just raise the machine enough to slip EMPCO JACKS under the base (the number depending on the size of the machine). Turn the adjusting screw up or down until the level indicator reads "zero," and the job's done.

To reduce vibration, VI-SORB mounting pads are available with each style EMPCO JACK. Write for specifications and prices today.

Style JS Screw type

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Precision 16" 5/8 "Capacity Drilling Machine
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saves time in tool-room and model shop by reducing set-up time and supplying correct speeds.

WIDE RANGE INSTANT SPEED SELECTION OF 150 TO 4000 R. P. M.

for drilling, reaming, spot-facing, counter-boring and tapping. Variable speed spindle with built-in back gears, driven by ½ HP single or three phase built-in motor. Completely enclosed drill head design; *no belt changing required.*

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Model 602, 600 to 4000 RPM, $290. FOB Milwaukee, Wisc., complete with motor, work light and cord.

Bench Model 601 variable speed counter-balanced head. Supplied with No. 2 Morse taper or Jacobs No. 2A taper.

Free Data on this advanced design precision drilling machine is available upon request.

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Only 3" high, weighs 30 ozs.!

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Tests any size, shape, type metal!

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One easy motion gives direct reading

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Enco

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SAVE VALUABLE SETUP TIME

The three photos at right illustrate the flexibility of 12-position indexing, whereby each tool may be used in three different working positions.

¾" square tool bit mounted in Model 4½-S turret used for facing cut.

√Accurate within .0005.

√Keeps setting accurately.

√12 position indexing.

√Indexing is self-contained—eliminates all chip-interference.

√Hardened steel construction.

√Mounts rigidly in compound T-slot.

The same tool used for broadface turning merely by indexing turret one position or 30°.

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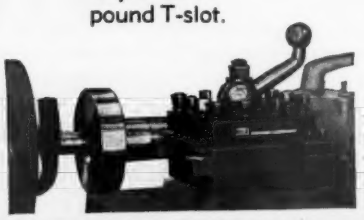
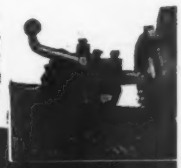


Same tool used for inside chamfer merely by indexing back two positions = 60°.



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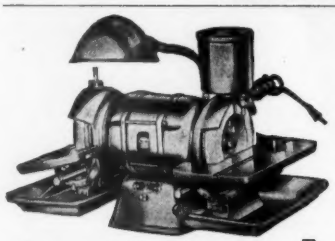

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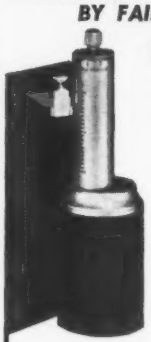
MICRO-HEIGHT GAUGE

BY FAIRFIELD GAUGE CO.



NO OTHER GAUGE COMPARES FOR FAST, ACCURATE LAYOUT AND MEASURING

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Capacities to 6" when used with this Fairfield Gauge 3" Riser

The Micro-Height Gauge is a precision instrument, finished in satin chrome, which reads like a micrometer and measures from zero at base to 3" in thousandths.

Use as a scriber for fast layout, or insert dial indicator for quick, accurate inspection.

Toolmakers, Layout men, and Inspectors do better work faster with Micro-Height Gauge.

Write for illustrated circular and prices.

Exclusive distributor for U.S. and Canada:

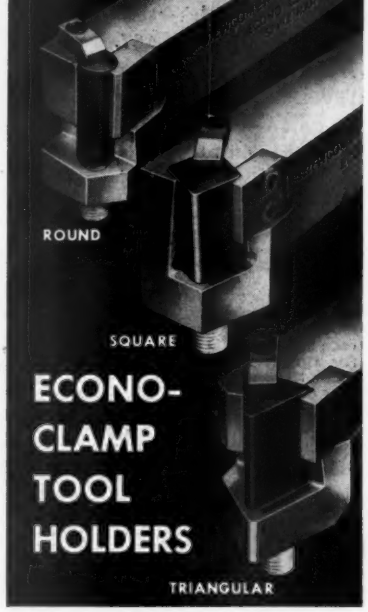
CLEVELAND INSTRUMENT CO.

735 Carnegie Ave., Cleveland, O.

CIRCLE INFORM-A-GRAM KEY NO. 1423

Cut Tool Costs and Inventories

Newcomer Mechanical Tool Holders and Carbide Inserts



ECONO-CLAMP TOOL HOLDERS

Newcomer Econo-Clamp Tool Holders provide a short-cut to economical production . . . machine down-time for tool grinding is minimized because multiple cutting edges on inserts can be utilized! Positive dual clamping features provide easy, quick and accurate indexing.

Econo-Clamps use standard full-length inserts or the more economical, short Newcomer "Throway" Carbide Inserts together with a hardened steel base anvil.

Newcomer Ad-Clamp Tool Holders are also available for use with standard rectangular blanks or the more durable Newcomer Step-Tip Blanks.

Send today for Newcomer Catalog 109-54!

NP CONTROLLED QUALITY CARBIDE

NEWCOMER PRODUCTS, INC.

Latrobe, Pa.

General Sales Office:

512 Franklin Ave., Pittsburgh 21, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 1424

. . . Special Machine, from page 140

frame, which supports and holds the tank section to be trimmed. The skeleton maintains the correct size and shape of the section during cutting.

The wheeled carriage rides the deck, guided by tracks, and contains its own traction unit, directly coupled to a self-contained gear reduction right-angle drive. A stationary chain engaged by a sprocket on the carriage power unit provides traction. A second motor, rotating at 3600 rpm, drives a 4-tooth saw, which is carbide-tipped for very long life.

The carriage, coolant supply, and saw are activated by the starting button and automatically cut off at completion of the cycle. The course is 200″ and roughly elliptical in shape. Only 40 seconds is required to complete the cycle.

Simple Brushing Operation Cuts Rejects by 12%

A simple brushing operation now in use at International Harvester Company's Louisville Works automatically removes the chips from the broach bar cutting internal splines in steel bull gear forgings. This brushing operation has eliminated a major cause of part rejections and has considerably increased broach life.

Prior to adapting brushes to this job, the broaching bar would quickly load up with chips causing rough and inaccurate splines. The machine operator was paid on a piece basis, and received no penalty for rejects. The net effect was a 12% rejection rate because of runout on the finished gears.

Brushing has successfully solved this problem, and, in addition, has helped double the life of the broaching bar before it must be removed for resharpening, in itself a costly operation.

A VMS-10-48 Pull-Down Colonial Broach machine is used, adapted with a special holder mounting four brushes mounted so that the broaching bar is surrounded by wire bristles. The brush bristles are .005 steel wire, 2″ long, used in 3″ strips. Width of the brush face is ¼″. This installation was developed by International Harvester with the cooperation of the Osborn Manufacturing Company, manufacturers and designers of power brushes.

The photo shows the brushing fixture mounted above the coolant ring. The continuous coolant flow removes some chips, but the brushes do the big job on the return or up-stroke of the broach.

This simple installation of stationary brushes to remove chips from the broaching bar resulted in:

1. Rejection rate materially reduced, accounting for sizeable savings in labor and material.
2. Fewer regrindings of the broach bar to get the same number of pieces, a savings in labor.
3. Improved quality and accuracy of splines broached.

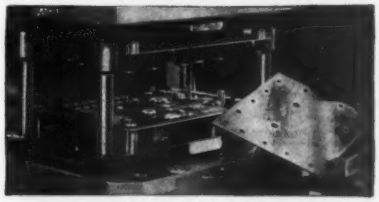
—by J. L. Krumpelman
Tool Development Engineer
International Harvester Co.

BUY U. S.
SAVINGS BONDS

New • Fast • Proven
LOW COST
methods for
PERFORATING
and NOTCHING
SHEET METALS

REDUCE DIE COSTS
All units and parts are interchangeable and used repeatedly in different arrangements. INCREASE PRESS PRODUCTION—*Down time is minutes as compared to hours for changeover.* For precision work in all types and sizes of presses. START PRODUCTION AT ONCE. Pierce materials up to ¼″ thick mild steel. Standard sizes and shapes available up to 3 inches. Special sizes to order.

Whistler MAGNETIC Dies
at work in large inclinable press. Magnetized retainers hold the units. No bolting required. A fast, economical method in making up a punch and die set for short or long runs. All parts re-usable.



Whistler ADJUSTABLE Dies
on perforating and notching job, using Tee slotted die set. With Whistler Adjustable Punch and Die units production starts within hours instead of weeks. Last minute job changes made quickly.

● Here are the complete details with prices and application illustrations. Send for these catalogs. No obligation.

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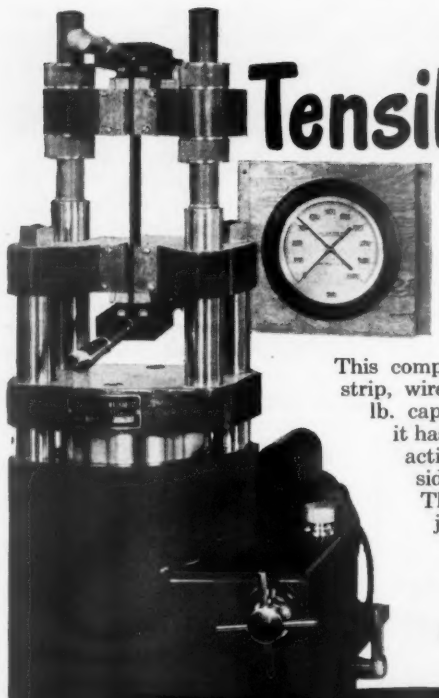
S. B. WHISTLER & SONS, Inc.
Adjustable, Magnetic, Custom and Cam Dies for all Industry
748 Military Road, Buffalo 23, N. Y.

For your convenience Whistler direct factory representatives are located in most principal cities. Their on-the-job application experience, combined with Whistler's 35 years experience in the manufacture of tools and dies, is available on request.

CIRCLE INFORM-A-GRAM KEY NO. 1431



Tensile Testing

Fast! Accurate! Easy!

This compact machine tests spotwelds, strip, wire, anything within its 20,000 lb. capacity. Hydraulically powered, it has an easily controlled ram, self-acting specimen grips that are open sided for easy specimen insertion. This tester, Model ST-1, is adjustable to take specimens 5" to 9" in length. Various load gauges, grips, and other modifications are available.

Write for more information – give us your requirements.

DETROIT TESTING MACHINE COMPANY

9386 *Grinnell Ave., Detroit 13, Mich.*

CIRCLE INFORM-A-GRAM KEY NO. 1441

No Tool Holder GRIPS like a Clark

- Adjustable Vee Block Grip
- Full Length Tool Contact
- Powerful Clamping Force
- No Harmonic Vibration
- No Chatter
- Grips Round, Square, Rectangular and Cut-Off Tool Bits
- One Holder Handles Many Bit Sizes
- Carbide Models Also Accommodate Boring Bars
- Tilted Head Improves Vision

SPECIFICATIONS

Specify Right or Left Hand Offset!

FOR CARBIDES (No Rake)	Model P60	P61	P62	P64
FOR HIGH SPEED STEEL (15° Rake)	Model 60	61	62	64
SIZE:	0	1	2	4
TOOL CAPACITY	1/8" to 5/16"	3/16" to 3/8"	1/4" to 1/2"	5/16" to 5/8"

Order from your dealer—Ask for Clark!

ROBERT H. CLARK COMPANY
9330 Santa Monica Blvd., Beverly Hills, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1442

DOES IT BETTER
DOES IT FASTER

SIMPLEX-M
ABRASIVE BAND GRINDER

The precision of a machine tool plus the durability of a workhorse. Complete with ½ H.P. Heavy Duty Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING WRITE TODAY

WALLS SALES CORP.
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CIRCLE INFORM-A-GRAM KEY NO. 1443

for AUTOMATION on slitter, shear or punch press

coil stock

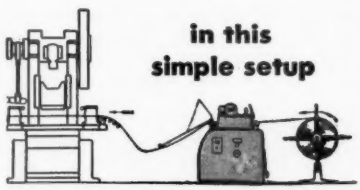
converted to workable

flat stock

by a LITTELL Variable Speed Straightener

Model 412-5PD
5 to 1 variable speed drive
Straightens steel stock up to .125" thick x 12" wide.

in this simple setup



Coil stock comes out of a Littell Straightener commercially *flat*, in perfect condition for accurate, automatic, high speed work on punch press, shear or slitter. The right straightener for your requirements is in the complete Littell line. *Write for the Littell Straightener Catalog*

F. J. LITTELL MACHINE CO.

4197 N. Ravenswood Ave., Chicago 13

CIRCLE INFORM-A-GRAM KEY NO. 1444

MACHINE TOOL RENTAL PLAN

The Gisholt Machine Company has initiated three plans by which manufacturers may lease machine tools. Each is based on a seven-year lease agreement. Each may be written either with or without the option to purchase. The right to terminate the agreement at the end of one, two or three years depends on the plan selected. The lease may also be written with the option to purchase.

This plan is designed to cover standard machines, plus the required electrical equipment. Certain accessories and all tooling do not come under the lease agreement. Special purpose machines will be leased by special arrangements.

The Gisholt Machine Company builds an extensive line of machine tools. These include turret lathes, automatic lathes, automatic turret lathes, static and dynamic balancers, etc. Any of these machines may be leased under this new plan.

Fast, Safe Way To Clean Tools, Dies and Small Parts

FOUNTAIN BRUSH ACTION and CLEAN FILTERED SOLVENT

FOR THE TOOL ROOM MAINTENANCE & PRODUCTION

Grease and dirt flows away as operator brushes and clear solvent flows through brush bristles. No splashing. Fits on work bench or portable stand, 20" square. Has separate dip tank at rear.

OTHER GRAYMILLS CLEANING UNITS UP TO 300 GAL. SIZE
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CIRCLE INFORM-A-GRAM KEY NO. 1451

WRITE FOR FREE SAMPLES of JIFFY PADDED SHIPPING BAGS

- *You've got to see how easy it is to pack for shipment in a Jiffy Bag.*
- *You've got to feel the thick cushioning of a Jiffy Bag to realize how well it protects your product in shipment.*
- *You've got to compare the time it takes to pack in a Jiffy Bag with your present packing method.*
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- *You've got to translate into dollars and cents the savings in time, labor and material to see how economical it is to use Jiffy Bags.*

To do all this—you must have a Jiffy Bag to make your own test shipment.

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Sharpens Taps, Saws grinds straight flutes

A versatile straight flute grinder that will:

a) Sharpen taps
b) Sharpen Saws in Gangs
c) Sharpen Reamers
d) Grinds straight flutes from solid
e) Spiral points
f) Sharpen milling cutters, Woodruff key cutters

Automatically indexes, no special skill needed!

Write for bulletin on 50F Automatic Universal Flute Grinder
Manufacturing Co. 3809 Ridge Rd., Cleveland 9, Ohio

WARDWELL

Maker of largest line of saw and tool sharpening machines

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S-22

MICROFINISH COMPARATOR

Men responsible for finish, specify control roughness with Electroformed pocket Comparators — the only inexpensive, uniform system of comparison.

22 precision surfaces to A.S.A. Standard B46.2

- Purchasing
- Engineering
- Inspection
- Shop
- Quality-Control

Save time, reduce costly overfinish.

- Made of Corrosion Resistant nickel.
- Convenient.
- Complete with leather case.

Write Dept. TP for literature and prices now.

BAPTIST MACHINE CO
36 LUDLOW STREET
STAMFORD, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 1461

Gurley Installs Linear Dividing Machine

A linear dividing machine, which can mark divisions to an accuracy of better than ± 0.0002 inch in a 40-inch length—at high production rates—has been installed at W. & L. E. Gurley, Troy, N. Y.

The machine was built by the Societe Genevoise d'Instruments de Physique (S.I.P.) of Geneva, Switzerland, which also supplied Gurley's two high-precision cir-

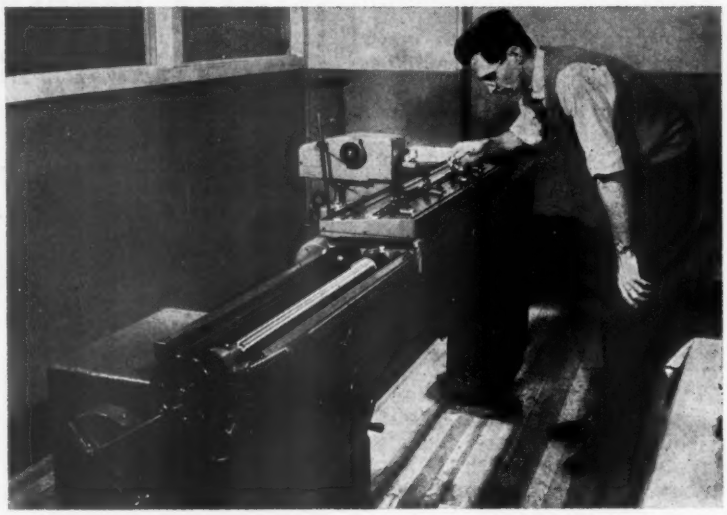


Photo courtesy Societe Genevoise d'Instruments de Physique (S.I.P.)

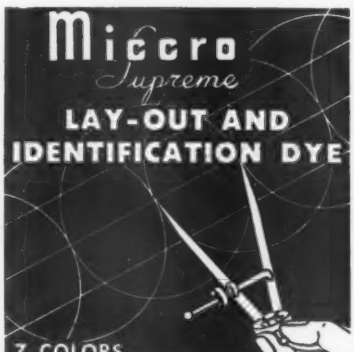
cular dividing machines for use in the production of transits, divided circles and precision circular patterns.

With the addition of the linear dividing machine, Gurley now has the most modern facilities for producing precise linear and circular optical measuring systems, complete with scales, reticles and optics. It is expected that this will contribute greatly to this country's machinery and tool manufacturing industry.

Other uses of the precision divider include: supplying standards of length to state bureaus of weights and measures; production of target scales for optical tooling methods in the aircraft, automotive and ship-building industries; furnishing toolroom master reference scales; and supplying precision photogrammetric plotting scales.

The variety of diamond and other scribing tools will permit the ruling of lines with widths varying from about .003 millimeters (.00012) for microscopic examinations to greater widths for direct visual examinations.

The precision machine "floats" on blocks of concrete supported by coil springs, thus eliminating vibration disturbances. It is installed in a completely air-conditioned room for maintaining stable temperature and humidity to the degree required for high-precision work.



For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheets, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.

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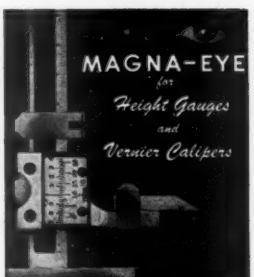

MAGNIFIES "Hard-to Read" Vernier Scales on Height Gages and Calipers

MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. LENS is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.
Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. 6 No. 100 for 8" Vernier Calipers; 6 No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; 6 No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" and 60" Calipers.
For Complete Information Write, Phone or Wire
STEBAR COMPANY
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STOP WASTING DRILLS!

FREE BOOKLET . . .

shows how to prevent excessive drill breakage, vastly prolong drill life . . . and eliminate time wasted by valuable skilled mechanics grinding drills!

Black Diamond's "Positive Positioning" feature positions drill to exact twist you want . . . *automatically*. Now anyone can sharpen and web-thin with scientific accuracy . . . on a Black Diamond Drill Grinder!

Write *Today!*

BLACK DIAMOND

Saw & Machine Works

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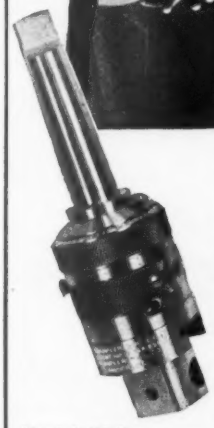
PRODUCTION MAGIC!

ALL IN 1 TOOL-HEAD



Boring, facing, turning, grooving, undercutting, all in one set-up with Chandler Duplex.

- **A Model For Any Size Machine**

A Boring Head that Won't Face is Not Complete

Write today for complete details.

CHANDLER TOOL COMPANY
MUNCIE, INDIANA

Model "D"

COMBINED BORING & FACING TOOL HEADS

Chandler-Duplex

CIRCLE INFORM-A-GRAM KEY NO. 1472

Here is the nut that resists stress, wear and vibration

Extra holding power need not add to the cost of any assembly. Gripco Lock Nuts are of one-piece design—thus low in initial cost. Their faster application reduces production costs, their greater holding power reduces mechanical wear and failures, which means longer product life for greater customer satisfaction. The Gripco Lock Nut, with triangular depressions on its top, provides frictional resistance to vibration and permits repeated removal and reapplication. The locking action is produced by a simple, vertical thread deflection, inherent in the nut itself—the same design that has held threaded fasteners tighter for over 50 years. If stress, wear or vibration poses a fastening problem for your products, see how a Gripco Lock Nut can give you a tighter hold, longer wear. Impervious to oil or water. Write for samples and full particulars.

GRIPCO PRODUCTS INCLUDE:

Gripco Lock Nuts, New Gripco "Clinch" Nuts, Gripco Hi-Nuts, Gripco Pilot-Projection and Countersunk Weld Nuts with or without Gripco locking feature.

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"after 50 years still holding strong"

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SOLVE YOUR HOLE ACCURACY PROBLEM with *Horberg* PRECISION PIN GAGES

EXCLUSIVE CONCENTRIC ENTRY

TAPER for faster, more definite inspection of holes, for greater ease in centering.

Gage sets supplied for all common drill sizes

CLEARANCE +0.0001" to +0.0005"

SETS: Two gages in each size, with convenient stand.

Letter Set (A-Z) 52 Gages $50.00

Fractional Set (1/64"-1", in steps of 1/64") 60 Gages 56.00

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ALL SHIPMENTS FROM STOCK

THE *Horberg* GAGE COMPANY

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ETALON No. 9

With Micrometer Adjusting Screw

HARDENED STAINLESS STEEL

$40.00 F. O. B., N. Y.

Overall Length 12" *Measuring Capacity 8½"*

World famous for accuracy. Hand fitted Vernier slide insures smooth, snug operation. Wide Vernier, exceptionally easy to read. English or English and Metric graduations. LENGTHS UP TO FIFTEEN FEET CAPACITY! Handsome, form-fitting wooden case.

FULLY GUARANTEED

ASK YOUR DEALER or write

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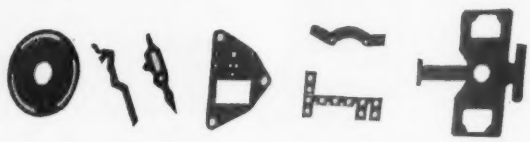
STAMPINGS---SHORT RUNS



A dependable service for small quantity requirements for new developments and production up to 50,000 pieces. QUICK DELIVERY — ACCURACY — backed by 23 years' experience.

Linden 3-4100 SMALL LOT STAMPING CO.

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Specify DESTACO Arbor Spacers and Shims

For milling, slitting and gang-saw setups, shimming gears and bearings. Sets in 20 diameters ⅜" to 4" . . . 19 graduated thicknesses .001" to .125", specials over .125". Spacers with keyways, shims without. Stocked by Industrial Distributors.

DESTACO DETROIT STAMPING COMPANY

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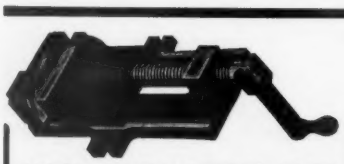

YOST DRILL PRESS VISE

● This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	23

Do you need a vise of ANY type? *Write today for bulletin on the extensive Yost line*

YOST MFG. COMPANY
1000 MAIN STREET
Meadville • Pennsylvania

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NEW! Butt Welds all blades from 1/16" to 3/4"

BREN-WELD PORTABLE BAND SAW BLADE WELDER

- Permits wide range of work from intricate tool and die to power cut-off saws.
- New large, heavy-duty transformer and simplified controls assure uniform welding results.
- Powerful built-in grinder removes flash from weld.
- Double gauge for checking thickness of weld on flat saws.
- Weighs only 35 pounds.

LIST $169.50 PRICE

Write today for complete details!

Manufactured by Brennen, Bucci & Weber, Inc.
SALES DIVISION
KASSON DIE & MOTOR CORP.
Integrity Since 1919
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CIRCLE INFORM-A-GRAM KEY NO. 1485

FOUR DIMENSIONS QUICKLY CHECKED

Simultaneous inspection of four dimensions on the carrier body of an automatic transmission is made with a new air and electric production gaging instrument. In one quick operation, an unskilled operator can accurately check the seat chamfer on the inside of the body, outside body diameter, over-all body

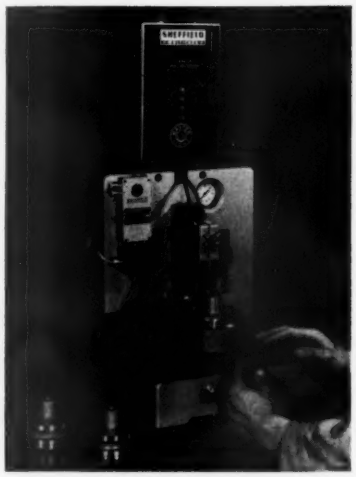

Photo courtesy The Sheffield Corp.

lengths, and the dimensions from the top of the shank to the bottom edge of the upper flange.

Three electrical gage heads check the outside dimensions. An Airlectric gage head checks the internal seat chamfer. A single master light on the panel shows white when the part being gaged is within tolerance on all dimensions, or red when one or more dimensions are out of tolerance. In the latter case, the faulty dimensions are indicated by the appropriate light on the visual panel turning red for undersize or green for oversize. No special operator skills are required for accurate gaging of the part.

CAMS

To Your Specifications

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— Except Screw Machine Cams —

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Design Assistance Offered

KIDDE PRECISION TOOL CORPORATION
30 Farrand St. Bloomfield, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1486

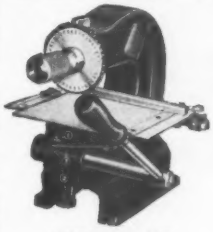
NUMBERALL
SUITS THE COST OF STAMPING NUMBERS

MODEL NO. 40B

Numbering and Lettering press
Mono Wheel Automatic Spacer

Designed for the purpose of impressing Letters and Numbers in all kinds of Name Plates and Flat Metal Parts. The Dials 3¾" Diameter are made of Special High Grade Tool Steel, scientifically hardened and tempered. The Characters are carefully engraved and make clear cut impressions of uniform depth. Standard Dials are engraved with 40 characters. Character Heights as follows: 1/16, 3/32, 1/8, 5/32, 3/16". Different size Dials are interchangeable. Carriage Table advances one space with each impression of the Dial, like a typewriter, doing rapid work, even spacing and perfect alignment. Plates up to 5" wide and 6" long can be stamped, but can furnish a longer Table and Rack if required. Depth of impressions is adjustable by a screw on bottom of machine. A direct sight gauge is provided to facilitate stamping in the proper place.

Specialists in making devices for stamping details into Nameplates, such as Automatic and Non-Automatic Numbering Machines, Type and Type Holders, and Chases, etc.; also Presses.



MODEL No. 40B

Bulletin TP-40B on request.

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1491

PRECISION-FINISH *The Odee-HONE*

★ ACCURATE
★ INEXPENSIVE
★ VERSATILE
★ LIGHTWEIGHT

YOUR OUTSIDE DIAMETERS

Corrects out-of-roundness, waviness, chatter . . . Generates diametric size within .0001" tolerance . . . Hones all parts from ½" to 2½" in diameter—regardless of length or material . . .

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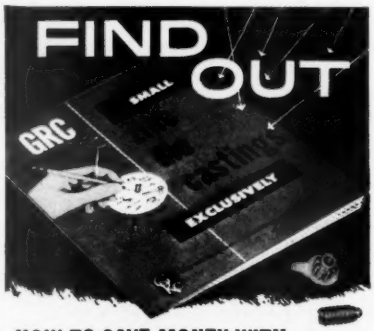

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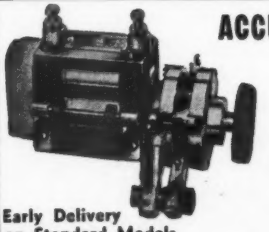

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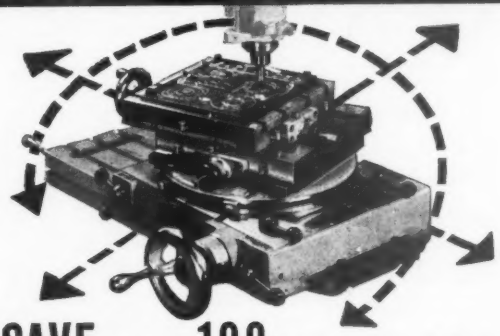

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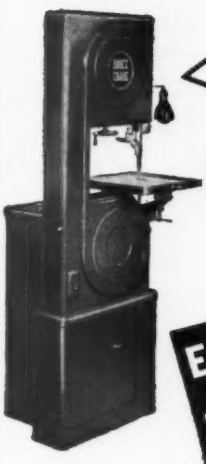

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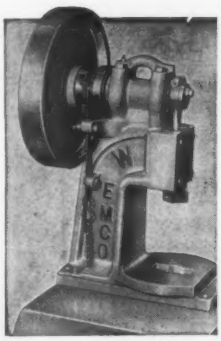

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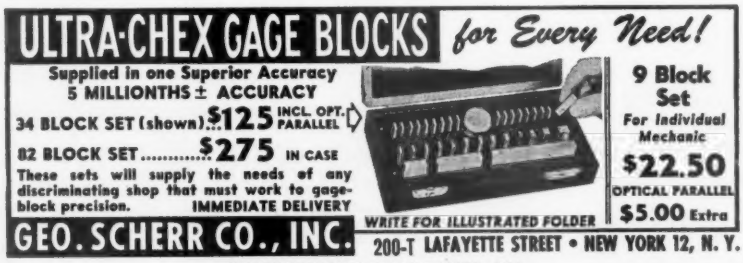
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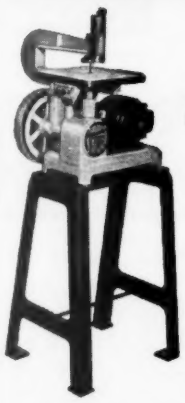

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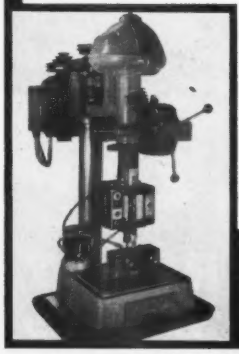

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PRODUCT OF COMMANDER BUILDER OF PRODUCTION TOOLS

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The liners of Jergens Live Bushings rotate with the bars preventing scoring and wearing of expensive boring bars. Every Jergens Live Bushing is made to the maximum bar capacity of the boring mill and can be easily "bushed-down" for precision adaption to any smaller size bar or combination of bars.

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- Adaptable to receive removable slip bushings, keys or keyways

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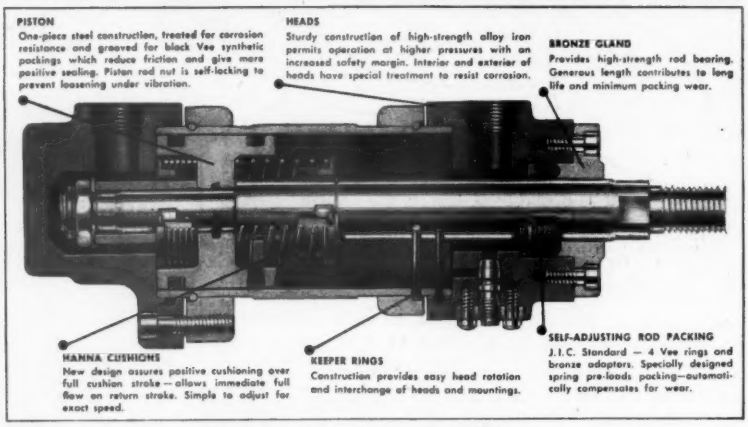
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One-piece steel construction, treated for corrosion resistance and grooved for black Vee synthetic packings which reduce friction and give more positive sealing. Piston rod nut is self-locking to prevent loosening under vibration.
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BRONZE GLAND
Provides high-strength rod bearing. Generous length contributes to long life and minimum packing wear.
HANNA CUSHIONS
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SELF-ADJUSTING ROD PACKING
J.I.C. Standard — 4 Vee rings and bronze adapters. Specially designed spring pre-loads packing—automatically compensates for wear.

■ We didn't design these cylinders with a "new look" in mind — although they have it. What's most important to you is their new performance . . . new operating features . . . new versatility. The cross-section points out just some of the new features. Others are: ground, polished, chrome-plated rods of alloy steel; cold drawn brass cylinder tubes; cushion adjustment dials; large fluid passages; and J.I.C. Standard leak-proof "O" ring gaskets.

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Inside and outside, Hanna "750" Fluid Power Cylinders are truly new. Together with their proved companions, Hanna LP and Hanna HP Cylinders, they offer a complete range of capacities, sizes and mounting styles to suit your requirements. For details, ask your Hanna Representative (see your classified telephone directory), or write for the new Catalog. No obligation.

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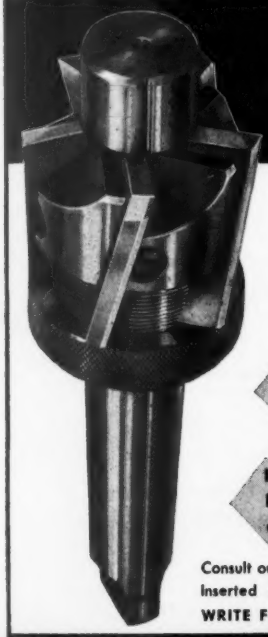

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CIRCLE INFORM-A-GRAM KEY NO. 1544

. . . Air Cylinders, from page 58

variable control valve slows the piston to a steady smooth feed. The oil system is closed and self-contained, the oil flowing from one side of piston to the other through the valves. Piston is returned by air pressure directed to the other side of piston through a suitable valving arrangement. These units are useful where an inexpensive variable feed is needed

This setup is valuable where grinding or milling have a tendency to create chatter, or where, in drilling, the tendency is to break drills.

Other cylinders of special application are the duplex (Fig. 6) and triplex cylinders, which can be purchased when space will not allow a larger cylinder to suit the desired pressure. In effect, they are nothing more than a number of cylinders positioned end for end and having a common piston rod.

Accordion-type boots can be furnished for protection where abrasive matter comes in contact with the piston rod—such as in foundries; forge shops; and in cases where exposure to weather is probable.

Where the cylinder is to be operated in temperatures in excess of 150° F, this fact should be noted in your order. The supplier will make the necessary modifications to assure the best life of the cylinder.

Not all of the features mentioned in this article are available from all companies making air cylinders. It should also be understood that all the features covered are not necessarily common practice. Each should be employed with respect to its merit in the system or design.

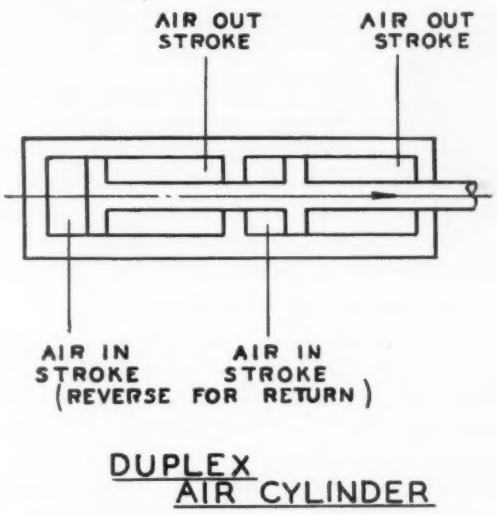


Fig. 6. The duplex cylinder substitutes for a large-diameter cylinder of conventional design.

Most companies in business today are set up on a competitive basis, and so it is with most manufacturers of air cylinders. There are many to choose from and, for the most part, they are all good.

Emphasis has been placed on the general overall picture of the types of air cylinders available and the pertinent information concerning their selection. In the next issue of T & P, we will concern ourselves with the approach to the design of special tooling using air cylinder force and control, with specific examples described and diagrammed.

Cylinders Power Two-Way Press

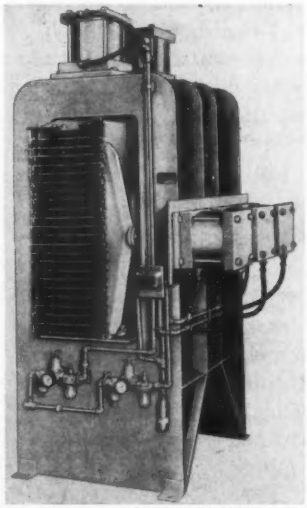
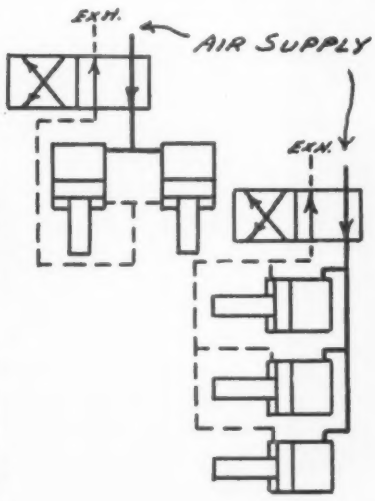


Photo courtesy Miller Fluid Power Co.



Less space is required by the Miller air cylinders to deliver the needed power for pressing plywood panels. The simple, convenient mounting and space-saving design facilitate installation.

Five of these cylinders are used on a two-way pneumatic press for clamping plywood cabinet end panels on a production basis. Twenty-four 14" x 44" panels are handled at one time. Pressure is required in both the vertical and horizontal directions simultaneously. Two air cylinders mounted on top supply the vertical pressure, and three air cylinders mounted at the side supply the horizontal. At 80 psi air input, a total pressing force of 3,200 lbs is delivered from the top cylinders and 4,800 lbs from the side.

Horizontal and vertical pressure must be applied simultaneously on the panels, requiring that each cylinder operate with the utmost precision.

Diagram shows that air from plant air system is fed through 4-way valves into the 5 cylinders. Valves can be manually regulated so that, if desired, either group of cylinders can be made to operate either before or after one another to compensate for operating variables.

. . . Pneumatic Tools, from page 67

cent of the man-hours required for large nut running can be accomplished by the use of suitable impact wrenches.

Care should be used in the selection of impact wrench sockets, since the torsional impacts delivered by pneumatic impact wrenches will readily cause failure of the socket unless it is made of special heat treated steel capable of withstanding the greater shock and vibration developed by impact wrenches.

Compression and Yoke Riveters

Compression riveters are designed to deliver a squeezing action which is used to drive rivets by flowing the rivet metal under compression. This squeezing action may also be applied to dimpling, pressing, forming, punching, shearing or any other operation requiring a compressive force. The squeezing action is obtained from a simple air piston and cylinder coupled to a cam, toggle or wedge which multiplies the force delivered as much as ten times. Exceedingly high compressive forces are thereby obtained from compact, light weight portable units having small diameter cylinders that use very little compressed air.

Figure 7.

Compression riveters have low operating costs and can effect marked savings. With compressed air costing 7 cents per 1000 cubic feet, the cost of air for driving 700 1/4-inch aluminum rivets with a compression riveter is only 1.4 cents. This power cost is nominal when compared to the savings that compression riveters can make in overall operation costs. They require no second operator to buck the rivets. Their pressure control assures uniformity of finished product. Quite operation minimizes fatigue throughout the working area. Portability of the tool often eliminates unnecessary moving of bulky work. The speed of operation is fast but controlled. A compression riveter can be adjusted to go through its complete squeezing cycle at a creep or it can complete it in one-third of a second. This flexibility is due to the responsiveness and controllability of compressed air as a power source.

Yoke riveters (Figure 7) or used for hot or cold percussive riveting. In addition, they are often used to clamp an object and vibrate it, or to drive two press-fit parts together.

A yoke riveter is an air operated clamp or vise combined with an air hammer that simultaneously supplies a squeezing force and a rapid sequence of hammer blows. The hammer blows do the work. The squeezing force is merely sufficient to hold the dies on the work, while the hammer blows are struck.

Yoke riveters are made in both portable and stationary types. Manufacturers have developed a wide range of portable and stationary yoke sizes to fit all work requirements.

The cost of power for a yoke riveter is nominal. Based upon compressed air costing 7 cents per 1000 cubic feet, 1000 1-inch hot or 3/8-inch cold steel rivets can be driven at a power cost of 35 cents. A yoke riveter does not require a second operator to buck the rivet. All hammer reaction is absorbed by the yoke, thus eliminating operator fatigue. Adjustments are provided for varying rivet lengths.

When the pieces to be riveted are large, excessive work handling costs can be eliminated by bringing a portable machine to the work instead of moving the work in and out of a stationary machine. Extremely lightweight yoke construction is permissible with percussion type yoke riveters. Thus, they are readily portable even when furnished with yoke throat depths of six feet or more.

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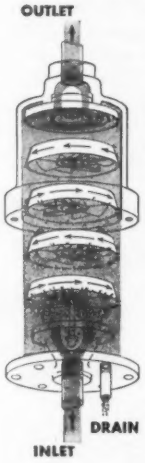

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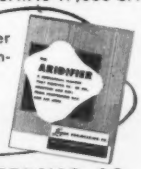

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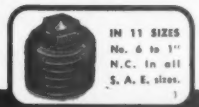

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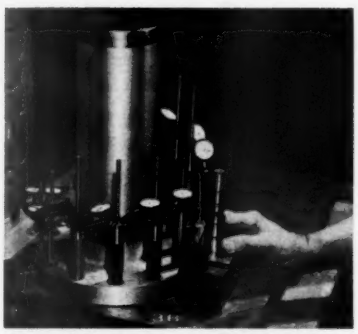

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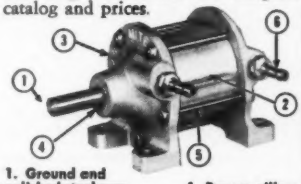

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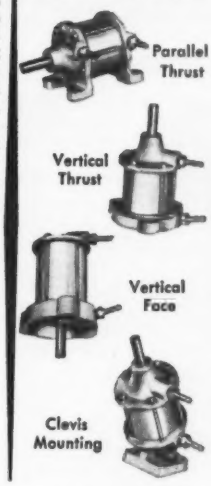

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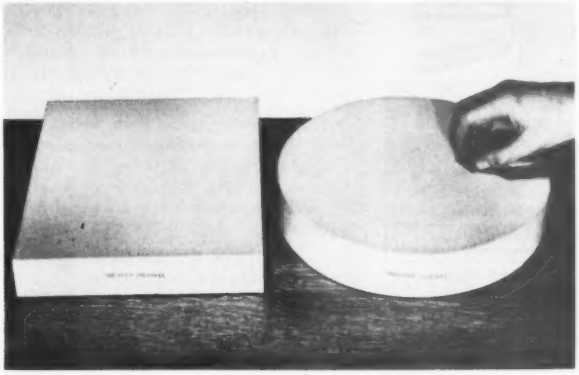

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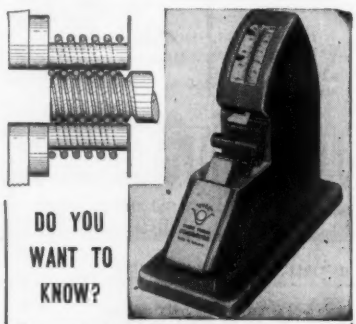

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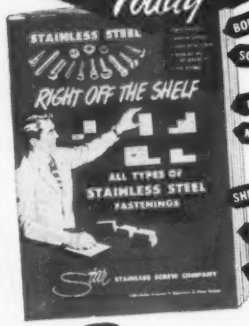

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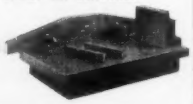

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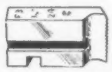

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The new pressing system, revealed recently by Jones & Laughlin Steel Corporation, employs an aluminum alloy clamp or sleeve that is squeezed around the wire rope in a special 300-ton hydraulic press. Called JalKlamp, the device is used as a mechanical method of splicing eyes, with or without thimbles, in the ends of wire rope. This "splice" gives 100% of the breaking strength of the wire rope itself.

Douglas J. Henecker, J. & L. spokesman says, "There is a big saving in the length of wire rope needed to make the splice, too. We figure we save about 85% of the rope length that would be necessary for a hand splice."

The JalKlamp system is simplicity itself, Mr. Henecker points out, whereas in making a conventional tucked splice, the rope has to be unlayed and then rewoven by hand.

The clamp or sleeve in the new system consists of a piece of metal tubing that looks like a heavy bracelet, oval in cross-section, with a place for the two ends of the wire rope cable to be clamped together. The sleeve material is a special non-corrosive aluminum alloy that combines great strength with the ability of cold flowing under pressure—at room temperature.

To make a splice, the wire rope is first measured, cut and inserted in the clamp. Then the clamp is crimped or squeezed around the wire. A pressed joint is formed without damage to the individual wires. The clamp metal actually flows into the space between the wires in the strands and between the strands themselves. The clamp thus becomes a part of the rope. This type of joint makes the splice water tight.

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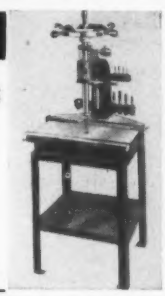

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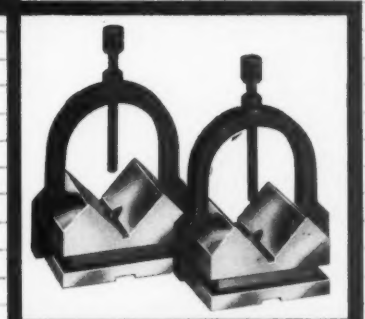

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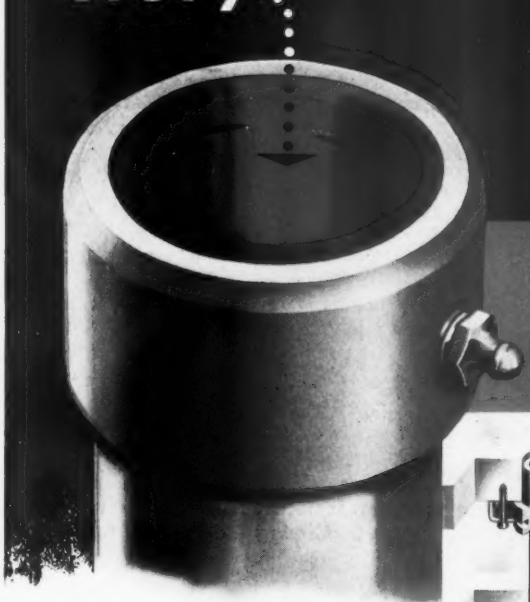

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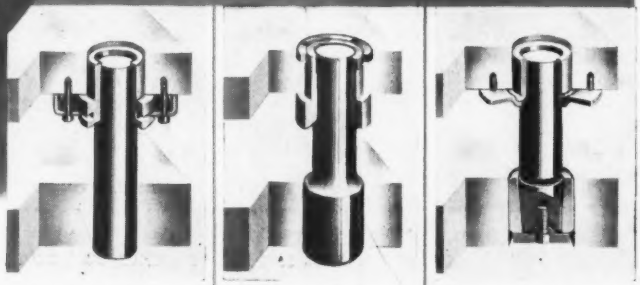

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